State of Connecticut

PUBLIC DOCUMENT No. 47

State Geological and Natural History Survey

HERBERT E. GREGORY, SUPERINTENDENT

BULLETIN No. 27

HARTFORD
Printed for the State Geological and Natural History Survey
1917

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State Geological and Natural History Survey

Publication Approved by the Board of Control

SEVENTH BIENNIAL REPORT OF THE COMMISSIONERS

OF THE

State Geological and Natural History Survey of Connecticut

1915-1916

HARTFORD
Published by the State
1917

LETTER OF TRANSMITTAL.

HARTFORD, CONN., December 30, 1916.

HIS EXCELLENCY, MARCUS H. HOLCOMB,
Governor of Connecticut.
Hartford, Connecticut.

Sir: — I have the honor to transmit to you herewith, in behalf of the Commissioners of the State Geological and Natural History Survey, the report of the Superintendent of the work, covering the two years ending December 31, 1916.

Very respectfully,

FLAVEL S. LUTHER,
Secretary of the Commission.

SEVENTH BIENNIAL REPORT OF THE GEOLOGICAL AND NATURAL HISTORY SURVEY OF CONNECTICUT

Retirement of Professor Rice.

At the meeting of the Commissioners, July 1, 1916, the resignation of William North Rice, Superintendent, was accepted, and Herbert E. Gregory was appointed as his successor. Professor Rice assumed the duties of the superintendency with the establishment of the Survey in 1903, adding the responsibilities of this office to those of an active professorship, and during the past thirteen years has rendered unusually valuable services to the State. The preliminary organization of the Survey and its guidance during the early years of its life have required exceptional qualifications. The scope of the work is large and the appropriations have been small. An intimate knowledge of the educational and economic needs of Connecticut, as well as broad scientific attainments, has been essential. The unselfish personality of Professor Rice and his devotion to the work of the Survey have enabled him to attract coworkers. On this the success of the organization has depended; its work has been done by a group of scientific men who were willing to devote part of their energies to the preparation of bulletins practically without financial compensation. Professor Rice has made friends for himself and friends for the Survey both within and without the State and set a high standard of work which the present Superintendent will endeavor to maintain. The enduring value of Professor Rice's work is expressed in the bulletins published. They bear the names of authorities in geology and natural history; the material which they contain is widely used by scientific workers; they show an unusually high standard of editorial excellence; they have a recognized place of usefulness in the educational equipment of Connecticut.

Scope and Plan of the State Survey.

The act of 1903 establishing the Survey proposed two subjects for investigation, viz, the geology of the State, and the natural history, or botany and zoölogy, of the State. It has been presumed to be the intent of the law that the appropriation should

be divided with some approach to equality between geology and biology. The law further specifies three aims with reference to which the work should be prosecuted: first, the purely scientific aim of advancing our knowledge of the geology and natural history of the State; second, the economic aim of leading to the most effective conservation and utilization of the resources of the State; third, the educational aim of promoting the work of the schools of the State by the publication of the results of investigation in a form adapted for the use of teachers.

It will be appropriate to outline briefly the plans adopted for the carrying out of these objects, and the work which has been already accomplished, or which is in progress.

The plan of organization which was outlined in the first report has been retained. Only one salaried officer has been appointed by the Commissioners, viz, the Superintendent. Other scientific men have been engaged to investigate particular subjects and prepare reports or bulletins thereon. In the great majority of cases the terms of contract with these scientific men have been that the investigator should receive a certain sum as compensation when the bulletin presented was accepted by the Superintendent, and that a certain allowance should also be made for the expenses of the work, the allotment for expenses to be drawn upon from time to time as the expenses were actually incurred. In some cases, however, this form of contract has been impracticable, as investigations have been commenced and prosecuted in regard to which it could not be foreseen how soon they would result in conclusions definite enough for publication. In such cases the agreement has been to pay the investigator a small sum per diem, a maximum limit being prescribed in every such case.

Each report prepared is published as a separate bulletin, the bulletins being numbered consecutively, generally in the order in which they are received. Each bulletin bears the name of the author or the names of the authors, and each author is responsible for his own work. The bulletins are issued in paper covers, but a part of the edition is reserved for binding. Bulletins 1 to 5 have been bound as Volume I, Bulletins 6 to 12 as Volume II, Bulletins 13 to 15 as Volume III, and Bulletins 16 to 21 as Volume IV. The bound volumes are especially desirable for public libraries and similar institutions, in which complete sets of our publications are to be preserved. The pamphlet form, in which each bulletin is complete in itself, is convenient for the large number of students, teachers, and others who have use for some particular bulletin. The publications of the Survey are distributed by the State Librarian. They are given liberally to colleges, public libraries, geological surveys, and other scientific

institutions, and to scientific men of repute in the branches of science with which the respective bulletins are concerned. In many cases books and papers of great value are received in exchange for the publications of the Survey. All books and papers thus received are deposited in the State Library. The publications of the Survey are also distributed liberally to citizens of our own State, particularly to teachers who can make use of them in their work. In the case of persons who are not known as scientific men, and who appear to have no special claim for the donation of the publications of the Survey, the bulletins are sold at prices sufficient to cover the cost of printing and transportation.

Bulletins already Published.

The Survey has already published the following bulletins:

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904.
2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut, by H. W. Conn.
3. A Preliminary Report on the Hymeniales of Connecticut, by E. A. White.
4. The Clays and Clay Industries of Connecticut, by G. F. Loughlin.
5. The Ustilagineae, or Smuts, of Connecticut, by G. P. Clinton.
6. Manual of the Geology of Connecticut, by W. N. Rice and H. E. Gregory.
7. Preliminary Geological Map of Connecticut, by H. E. Gregory and H. H. Robinson.
8. Bibliography of Connecticut Geology, by H. E. Gregory.
9. Second Biennal Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906.
10. A Preliminary Report on the Algae of the Fresh Waters of Connecticut: by H. W. Conn and L. W. (Hazen) Webster.
11. The Bryophytes of Connecticut, by A. W. Evans and G. E. Nichols.
12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908.
13. The Lithology of Connecticut, by Joseph Barrell and G. F. Loughlin.
14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation, by a Committee of the Connecticut Botanical Society.
15. Second report of the Hymeniales of Connecticut, by E. A. White.
16. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part I, General Introduction, by

W. E. Britton. Part II, The Euplexoptera and Orthoptera of Connecticut, by B. H. Walden.

17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-1910.

18. Triassic Fishes of Connecticut, by C. R. Eastman.

19. Echinoderms of Connecticut, by W. R. Coe.

20. The Birds of Connecticut, by J. H. Sage and L. B. Bishop, assisted by W. P. Bliss.

21. Fifth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1911-1912.

23. Central Connecticut in Geologic Time, by Joseph Barrell.

24. Triassic Life of the Connecticut Valley, by R. S. Lull.

25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914.

The publications made in cooperation with the United States Geological Survey are given on page 13.

Since the last Biennal Report, Bulletins 23 and 24 have been published. Bulletin 23, Central Connecticut in Geologic Time, by Joseph Barrell, deals with the series of geologic events affecting central Connecticut up to the present time. The conditions at successive epochs of geologic time are represented by structure sections.

Bulletin 24, Triassic Life of the Connecticut Valley, by Richard Swan Lull, deals with the fauna and flora of Triassic time in relation to its environment. It affords the most complete account of the many footprints — the so-called "bird tracks" — and of the few skeletons which constitute the evidence for the existence of dinosaurs in the Connecticut Valley.

Bulletins in Press or approved for Publication by the Board of Control.

A bulletin on the Arthrostraca of Connecticut, by Beverly Waugh Kunkel, Professor of Biology in Lafayette College, is now in press. It treats in detail of two suborders of Crustacea which have been found in the State — Amphipods and Isopods — less fully of forms from neighboring States which possibly can be found in this State; and presents to the reader biologic, anatomic, and economic views of the subject.

A bulletin on the Hymenoptera of Connecticut (to appear as Bulletin 22), prepared under the direction of Wilton Everett Britton, by Henry Lorenz Viereck, and constituting Part III of a work on a Guide to the Insects of Connecticut, is also in press. Parts I and II of the Guide have appeared as Bulletin 16.

The Hymenoptera include many insects of interest to agriculturists.

The publication of a paper on the Peat Deposits of Connecticut, prepared by Charles Albert Davis, with the field assistance of E. C. Miller and T. T. Giffen, has been delayed on account of the recent death of the author. Because of his thorough knowledge of this subject, gained by a reconnaissance of the peat deposits of the coastal states from Maine to Florida, which he carried on under the United States Geological Survey, such a work by Mr. Davis will be of interest to the people of Connecticut from a scientific and economic standpoint.

Bulletins accepted for Publication.

Four bulletins which have recently been completed by their authors have been accepted by the Superintendent for publication.

A Check-list of Insects of Connecticut, by Wilton Everett Britton, will be of value to institutions as well as to individuals in the identification of insects in the State. As Mr. Britton has been assisted in his work of records and identification of species by collectors and specialists in entomology in and near Connecticut, the list though necessarily incomplete is believed to be accurate. It has been preceded by Bulletins 16 and 22 (still in press) of this Survey, which also deal with the insects of the State, and is to be followed by another now in preparation dealing with Hemiptera.

A paper on the Quaternary Geology of the Southern Lowland of Connecticut has been prepared by Freeman Ward. It consists of descriptions of the preglacial, glacial, and postglacial conditions of the New Haven region and also of descriptions of the land formation, composition, and the causes thereof.

A paper has been prepared by Miss Ruth Sawyer Harvey on Drainage and Glaciation in the Central Housatonic Basin. The streams in this basin vary from the normal type and are discussed in relation to their geologic history. A general description of the region centering at Danbury is given from a geologic standpoint.

The Physical Geography and Geology of the Pawcatuck Valley has been prepared by Miss Laura Hatch. Its aim is to give a complete geologic and physiographic description of a region which contains type physiographic and petrographic features. A description of the area about Westerly, Rhode Island, is included.

The following bulletins accepted for publication have not yet been completed:

The Bacteria of the Fresh Waters of Connecticut, by H. W. Conn and L. R. (Potter) Hedenburg.

Report on Thames River Terraces, by F. P. Gulliver.
Decapods of Connecticut, by A. E. Verrill.
Hemiptera of Connecticut, by W. E. Britton and others.

Cooperation with the United States Geological Survey.

During the years 1915-1916, the State Geological and Natural History Survey has cooperated with the United States Geological Survey in the study of the water resources of Connecticut. The contract under which cooperation was effected was that in force during the years 1911-1912 and 1913-1914 and renewed for the the biennial term, 1915-1916.[1]

Since by mutual consent the cooperative agreement ceases at the close of the Federal fiscal year, June 30, 1917, it is in order to review the results:

By the terms of the contract, the United States Geological Survey assumed responsibility for the prosecution of the work, and Herbert E. Gregory, Geologist of the Federal Survey, was appointed to direct the investigations. The purpose of the series of studies is to determine the position, amount, and quality of the waters — particularly underground waters — of the State of Connecticut and to discuss their economic utilization. The value of such studies depends upon their usefulness not only to communities using a common supply but to individual landholders, and the preparation of reports has, therefore, involved detailed mapping and local descriptions. The position of ground water with reference to the land surface has been determined, areas of open field, forest, rock, and types of glacial soil have been outlined; water from springs, wells, and brooks has been analyzed; and studies of the most economical and sanitary supplies for farms and villages have been made. By description and discussion in the text, by tabulation of statistics and representation of data on maps and sections, the conclusions of the authors regarding amount, quality, and availability of water supply of each town are given.

The field work has been carried on by members of the United States Geological Survey, Arthur J. Ellis, Gerald A. Waring, and Harold S. Palmer, whose names will appear as authors of the reports. The value of the investigations has been much increased by the supervision and assistance of O. E. Meinzer and R. B. Dole, officers of the Water Resources Branch of the Federal Survey.

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[1] The terms of the contract appear in the Sixth Biennal Report of the Commissioners of the State Geological and Natural History Survey, Bull. 25, pp. 8-10, 1915.

At the end of the present field season a survey of the following towns will have been completed:

Ansonia	Greenwich	Salisbury
Avon	Hartford	Saybrook
Barkhamsted	Hartland	Seymour
Beacon Falls	Harwinton	Simsbury
Berlin	Manchester	Southbury
Bethlehem	Marlborough	Southington
Bloomfield	Meriden	South Windsor
Bristol	Middlebury	Stamford
Burlington	Middlefield	Suffield
Canaan	Middletown	Thomaston
Canton	Naugatuck	Waterbury
Cheshire	New Britain	Watertown
Cromwell	New Canaan	Westbrook
Darien	New Hartford	West Hartford
East Granby	North Canaan	Weston
East Hartford	Norwalk	Westport
East Windsor	Old Lyme	Wethersfield
Enfield	Oxford	Wilton
Essex	Plainville	Windham
Farmington	Plymouth	Windsor
Franklin	Prospect	Windsor Locks
Glastonbury	Ridgefield	Wolcott
Granby	Rocky Hill	Woodbury

These 69 towns comprise 35 per cent of the area of the State and include 50 per cent of its population.

By agreement, the results of these investigations of the water resources of Connecticut are to be published as water-supply papers of the United States Geological Survey, and the expense of publication is to be met by the Federal Treasury. Each water-supply paper will bear the title: "Prepared in Cooperation with the Connecticut Geological and Natural History Survey," and the contract reserves the right of the State of Connecticut to publish or republish all or parts of the reports,

The following publications have appeared:

Ground Water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook Areas, Connecticut, by H. E. Gregory and A. J. Ellis, Water-Supply Paper 374, 1916.

Ground Water in the Waterbury Area, Connecticut, by A J. Ellis, Water-Supply Paper 397, 1916.

Water-Supply Paper 374 represents the first systematic attempt to investigate the ground water in the State. The area described covers 715 square miles and includes the towns of Hartford, West Hartford, Newington, Wethersfield, East Hartford, Manchester, Windsor, East Windsor, South Windsor, Bloomfield, Stamford, Greenwich, Salisbury, Canaan, North Canaan, Windham, Franklin, Saybrook, Essex, Westbrook, and Old Lyme. The aim of the paper is to show how much water is stored under-

ground, how the supply fluctuates, what its quality is, how it can be procured, and how much can be secured from streams.

Water-Supply Paper 397 covers work on an area of about 171 square miles, and includes the towns of Ansonia, Seymour, Oxford, Beacon Falls, Naugatuck, Middlebury, Waterbury, Watertown, Thomaston. This region is rich in good water-power sites and well provided with water for municipal supplies, but the conflicting demands of water users have given rise to local problems of conservation. This report records facts and recommendations on which regulations for the use of water may be based.

These publications and also Water-Supply Paper 232, by H. E. Gregory, Underground Water Resources of Connecticut, which deals with the State as a whole, may be obtained free of charge from the Director, United States Geological Survey, Washington, D. C.

Papers in process of publication are the following:

Waters of the Pomperaug Valley, Connecticut, by A. J. Ellis. (Manuscript in preparation.) This report is based on field work done in 1913 and a series of stream, well, precipitation, and evaporation measurements carried on continuously from May, 1913, to December, 1916, by Ernest W. Parkin, George A. Parkin, and Ralph V. Wooden, under the direction of A. J. Ellis and H. S. Palmer.

Ground Water in the Meriden Area, Connecticut, by Gerald A. Waring. (Manuscript completed.) This report covers the towns of Meriden, Berlin, Middlefield, Middletown, Cromwell, and Rocky Hill. It includes chapters on geography and geology of each town and discusses the water supplies in detail under the headings: water in till, water in stratified drift, water in bedrock, springs, wells, quality of water.

Water Resources of the Cheshire-Granby Area, Connecticut, by Harold S. Palmer. (Manuscript completed.) This report treats of the geography, surface geology, and water resources of the following towns: Cheshire, Prospect, Southington, Wolcott, New Britain, Plainville, Bristol, Plymouth, Farmington, Avon, Burlington, Harwinton, Simsbury, Canton, New Hartford, Granby, Barkhamsted, and Hartland.

Ground Waters of the Suffield, Glastonbury, and Norwalk Areas, Connecticut, by Harold S. Palmer. (Surveyed in 1916, manuscript in preparation.) The towns covered by this report are Suffield, East Granby, Windsor Locks, Enfield; Glastonbury, Marlborough; Norwalk, Darien, New Canaan, Westport, Weston, Wilton, and Ridgefield.

These reports are for general distribution and when published may be obtained free of charge by addressing: Director, United States Geological Survey, Washington, D. C.

The total expense to the State of Connecticut for the six years' investigation of water resources under the cooperative agreement is $6,000. The Federal Government has expended an equal amount in addition to the cost of supervision and administration and the large expense of publication.

It is believed that this work, probably the most exhaustive study of a water-supply problem so far undertaken for a large area, has high value. The publications record basal studies whose results will become more useful as the population increases and problems of water rights and of sanitation become more complicated.

Plans for Future Work.

I. *Geology*.

The geology and physical geography of Connecticut possess features of unusual interest. The bulletins already published, The Manual of Geology, The Geological Map, Clays and Clay Industries, Triassic Life, and other reports, have been found useful. It is desirable to continue geologic investigation to include other and more detailed studies of areas and special problems. Among the bulletins which should be prepared are the following:

Connecticut during the Ice Age. An explanatory description of the surface deposits, lakes, waterfalls, eskers, drumlins, and other topographic features for which the glaciers of Pleistocene time are responsible. Requests for the publication of such a report have come from teachers and other citizens.

Mineralogy of Connecticut. A descriptive list of the minerals of the State, their occurrence, their geologic relations, and economic value.

Physical Geography. A number of papers of moderate size dealing with the geographic factors concerned with the location of cities, of routes of travel, and the development of industries would find a useful place. The reports should be made of type localities and eventually combined to form a bulletin on the physical geography of the State.

Feldspars of Connecticut. A bulletin describing the location and extent of feldspar deposits and their availability for commercial purposes.

Road-making Materials. A study of rocks of the State with reference to their suitability for use as crushed stone for road construction and concrete.

II. Botany.

The systematic botany of the flowering plants of southern New England is comparatively well known and a list of flowering plants and ferns of Connecticut has been published by the Survey. Of the flowerless plants, the mosses, liverworts, fungi, fresh water algae and bacteria have been treated in Survey reports, which have received high commendation. Bulletins on the following subjects would be welcomed by students and investigators:

The Marine Algae of the Connecticut Shore.
The Lichens of Connecticut.

A series of bulletins on plant ecology, a study of the distribution and relations of plants with reference to soil, altitude, rainfall, etc., should be prepared. Such studies have been undertaken by surveys of other States and by various scientific organizations, and the published results are among the most interesting contributions to science.

III. Zoölogy.

Bulletins on the birds of Connecticut, on the fresh water Protozoa, on the Echinoderms and two parts of a Guide to the Insects of Connecticut have been published. A bulletin on the Amphipods and Isopods is in press, and Professor Verrill reports that his paper on the Crustacea is nearing completion. It is desirable that in future years bulletins should appear on mammals, fishes, reptiles, Amphibia, and on selected species of marine fauna. Their publication is desirable from both educational and economic viewpoints.

Appropriation Desired.

In comparison with the financial support given by other states the appropriation for the Connecticut Survey is small. With $1,500 a year, it is obviously impossible to pay salaries to a corps of scientific workers who devote their entire time to the State. Field work must be done in vacations by men who are willing to undertake such work for a nominal compensation. Laboratory investigation and writing of bulletins must be done either in vacations or at odd times by professors, teachers, and others who are interested in the educational scientific problems of the State. The amount of valuable material already published by the Survey in comparison with its very small cost is a striking illustration of the economy of this procedure.

It is the intention of the Superintendent to devote the appropriation which may be available for the years 1917-1919 to the

completion of investigations already commenced or contracted for and to the final preparation for publication of manuscripts which have been on hand for several years. For these purposes the amount which has been regularly appropriated for the past thirteen years will probably suffice if rigid economy be exercised. We shall, therefore, content ourselves with asking the General Assembly to renew the usual appropriation of $3,000 for the ensuing biennial term. But it will be impossible to continue the work permanently on this basis. To offer a man of high scientific attainments $50 or $100 for an authoritative report on an investigation which may require his unoccupied time for two or three years is to demand a large public service with very little recognition. It is doubtful if the good will of such men as the Survey desires to employ can be treated as an asset for an indefinite length of time under conditions like this. If the work of the Survey is to be carried on in an efficient manner a biennial appropriation of at least $5,000 will soon become essential.

State of Connecticut

PUBLIC DOCUMENT No. 47

State Geological and Natural History Survey

HERBERT E. GREGORY, SUPERINTENDENT

BULLETIN No. 28

HARTFORD
Printed for the State Geological and Natural History Survey
1919

State Geological and Natural History Survey

Publication Approved by the Board of Control

EIGHTH BIENNIAL REPORT OF THE COMMISSIONERS

OF THE

State Geological and Natural History Survey of Connecticut

1917 - 1918

HARTFORD
Published by the State
1919

LETTER OF TRANSMITTAL

HARTFORD, CONN., December 28, 1918.

HIS EXCELLENCY, MARCUS H. HOLCOMB,
Governor of Connecticut,
Hartford, Connecticut:

Sir:—I have the honor to transmit to you herewith, in behalf of the Commissioners of the State Geological and Natural History Survey, the report of the Superintendent of the work, covering the two years ending December 31, 1918.

Very respectfully,
FLAVEL S. LUTHER,
Secretary of the Commission.

EIGHTH BIENNIAL REPORT OF THE GEOLOGICAL AND NATURAL HISTORY SURVEY OF CONNECTICUT

Scope and Plan of the State Survey.

The act of 1903 establishing the Survey proposed two subjects for investigation, viz, the geology of the State, and the natural history, or botany and zoology, of the State. It has been presumed to be the intent of the law that the appropriation should be divided with some approach to equality between geology and biology. The law further specifies three aims with reference to which the work should be prosecuted: first, the purely scientific aim of advancing our knowledge of the geology and natural history of the State; second, the economic aim of leading to the most effective conservation and utilization of the resources of the State; third, the educational aim of promoting the work of the schools of the State by the publication of the results of investigation in a form adapted for the use of teachers.

The plan of organization which was outlined in the first report has been retained. Only one salaried officer has been appointed by the Commissioners, viz, the Superintendent. Other scientific men have been engaged to investigate particular subjects and prepare reports or bulletins thereon. In past years the usual terms of contract with these scientific men have been that the investigator should receive a certain sum as compensation when the bulletin presented was accepted by the Superintendent, and that a certain allowance should also be made for the expenses of the work, the allotment for expenses to be drawn upon from time to time as the expenses were actually incurred. Some contracts have been made to pay the investigator a small sum per diem, a maximum limit being prescribed in every such case.

Experience has demonstrated that the agreements concluded between the Survey and authors have not produced the desired results. Under the old plan the funds allotted to investigators have barely covered necessary expenses, and the time allowed for the completion of a report has been practically unlimited. Consequently, the obligations to the Survey have been considered secondary, and an unreasonable length of time has elapsed between the granting of an appropriation and the publication of results. The delay has resulted in some financial loss and a con-

siderable loss to the scientific interests of the State. With the increase in appropriations for the Survey it has been possible to make such arrangements with scientific workers as to insure active and continuous interest in the problems undertaken. In making new contracts it is the policy of the Superintendent to include an agreement as to the date at which the completed report is to be submitted and to discontinue allotments for projects on which no work has been done for many years.

Each report prepared is published as a separate bulletin, the bulletins being numbered consecutively, generally in the order in which they are received. Each bulletin bears the name of the author or the names of the authors, and each author is responsible for his own work. The bulletins are issued in paper covers, but a part of the edition is reserved for binding. Bulletins 1 to 5 have been bound as Volume I, Bulletins 6 to 12 as Volume II, Bulletins 13 to 15 as Volume III, Bulletins 16 to 21 as Volume IV, and Bulletin 22 as Volume V. The bound volumes are especially desirable for public libraries and similar institutions, in which complete sets of our publications are to be preserved. The pamphlet form, in which each bulletin is complete in itself, is convenient for the large number of students, teachers, and others who have use for some particular bulletin. The publications of the Survey are distributed by the State Librarian. They are given liberally to colleges, public libraries, geological surveys, and other scientific institutions, and to scientific men of repute in the branches of science with which the respective bulletins are concerned. In many cases, books and papers of great value are received in exchange for the publications of the Survey. All books and papers thus received are deposited in the State Library. The publications of the Survey are also distributed liberally to citizens of our own State, particularly to teachers who can make use of them in their work. In the case of persons who are not known as scientific men, and who appear to have no special claim for the donation of the publications of the Survey, the bulletins are sold at prices sufficient to cover the cost of printing and transportation.

BULLETINS PUBLISHED.

The Survey has already published the following bulletins:

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904. 1904. 18 pp.

2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut, by H. W. Conn. 1905. 69 pp., 34 pls.

3. A Preliminary Report on the Hymeniales of Connecticut, by E. A. White. 1905. 81 pp., 40 pls.

4. The Clays and Clay Industries of Connecticut, by G. F. Loughlin. 1905. 121 pp., 13 pls., 1 fig.

5. The Ustilagineae, or Smuts, of Connecticut, by G. P. Clinton. 1905. 45 pp., 7 pls.

6. Manual of the Geology of Connecticut, by W. N. Rice and H. E. Gregory. 1906. 273 pp., 31 pls., 22 figs.

7. Preliminary Geological Map of Connecticut, by H. E. Gregory and H. H. Robinson. 1907. 39 pp., 1 map, 1 fig.

8. Bibliography of Connecticut Geology, by H. E. Gregory. 1907. 123 pp.

9. Second Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906. 1906. 23 pp.

10. A Preliminary Report on the Algae of the Fresh Waters of Connecticut, by H. W. Conn and L. W. (Hazen) Webster. 1908. 78 pp., 44 pls.

11. The Bryophytes of Connecticut, by A. W. Evans and G. E. Nichols. 1908. 203 pp.

12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908. 1908. 30 pp.

13. The Lithology of Connecticut, by Joseph Barrell and G. F. Loughlin. 1910. 207 pp., 6 tables.

14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation, by a Committee of the Connecticut Botanical Society. 1910. 569 pp.

15. Second Report on the Hymeniales of Connecticut, by E. A. White. 1910. 70 pp., 28 pls.

16. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part I, General Introduction, by W. E. Britton. Part II, The Euplexoptera and Orthoptera of Connecticut, by B. H. Walden. 1911. 169 pp., 11 pls., 66 figs.

17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-1910. 1910. 31 pp.

18. Triassic Fishes of Connecticut, by C. R. Eastman. 1911. 77 pp., 11 pls., 8 figs.

19. Echinoderms of Connecticut, by W. R. Coe. 1912. 152 pp., 32 pls., 29 figs.

20. The Birds of Connecticut, by J. H. Sage and L. B. Bishop, assisted by W. P. Bliss. 1913. 320 pp.

21. Fifth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1911-1912. 1912. 27 pp.

22. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part III, The Hymenoptera, or Wasp-like Insects of Connecticut, by Henry Lorenz Viereck in collaboration with A. D. MacGillivray, C. T. Brues, W. M. Wheeler, and S. A. Rohwer. 1916. 824 pp., 10 pls., 15 figs.

23. Central Connecticut in Geologic Time, by Joseph Barrell. 1915. 44 pp., 9 figs.

24. Triassic Life of the Connecticut Valley, by R. S. Lull. 1915. 285 pp., 12 pls., 3 maps, 126 figs., 1 section.

25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914. 1915. 24 pp.

26. The Arthrostraca of Connecticut, by Beverly Waugh Kunkel. 1918. 261 pp., 84 figs.

27. Seventh Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1915-1916. 1917. 17 pp.

Interest in these publications and their usefulness to the people of Connecticut is indicated to some degree by the number of requests for copies. The following summary is furnished by the State Librarian:

Bulletin	Date issued	Number of copies printed	Number of copies now on hand
1	1904	3,000	8
2	1905	3,500	Out of print
3	1905	3,500	140
4	1905	3,500	325
5	1905	3,500	400
6	1906	4,000	Out of print
7	1907	3,500	100
8	1907	3,500	440
9	1906	3,000	210
10	1908	3,500	615
11	1908	3,000	740
12	1908	3,000	27
13	1910	3,500	1,000
14	1910	4,000	1,000
15	1910	3,500	1,400
16	1911	3,500	1,000
17	1910	3,000	500
18	1911	3,500	800
19	1912	3,500	1,300
20	1913	4,500	1,000
21	1912	3,000	1,200
22	1916	3,500	1,300
23	1915	4,000	1,600
24	1915	4,000	1,200
25	1915	2,900	200
26	1918	3,000	Not yet distributed
27	1917	2,900	75
Vol. I	600 copies of each bulletin as listed above used for binding		280
" II			232
" III			294
" IV			338
" V			425

The editions of Bulletins 2 and 6 are exhausted for distribution purposes, as is also the Geological Map mounted for use on walls, accompanying Bulletin 7. The State Libraran remarks:

"Bulletin 2 has been and still is very popular, judging from the requests received. Bulletin 6, Manual of the Geology of

Connecticut, should certainly be reprinted, as it has been out of print some time and is a popular bulletin, perhaps the most poular of those issued."

Copies of all bulletins may still be obtained in bound volumes.

The publications made in co-operation with the United States Geological Survey are given on page 14.

Since the last Biennal Report, Bulletins 22 and 26 have been published. Bulletin 22, The Hymenoptera, or Wasp-like Insects, of Connecticut, is Part III of a Guide to the Insects of Connecticut (Parts I and II appeared as Bulletin 16), and was prepared under the direction of Wilton Everett Britton, State Entomologist and Entomologist of the Connecticut Agricultural Experiment Station, by Henry Lorenz Viereck, Assistant Biologist, United States Biological Survey, in collaboration with A. D. MacGillivray, Associate Professor of Systematic Entomology, University of Illinois; C. T. Brues, Instructor in Economic Entomology, Bussey Institution, Harvard University; W. M. Wheeler, Professor of Economic Entomology, Bussey Institution, Harvard University; and S. A. Rohwer, Specialist in Forest Hymenoptera, United States Bureau of Entomology. It is an exhaustive presentation of the subject, all Hymenoptera so far found in the State being listed; it has 824 pages, and many requests for reproduction in other scientific papers have come for several of its 25 illustrations.

According to some authorites, the Hymenoptera, which include ants, wasps, bees, etc., comprise the largest and most specialized order of insects. The species differ widely in form and habit; some are of economic value because they are parasitic on injurious insects (which suggests a plan to breed such parasites for the purpose of destroying injurous insects); some, because they pollinate flowers; and others, because they produce honey.

Bulletin 26, The Arthrostraca of Connecticut, by Beverly Waugh Kunkel, Professor of Biology at Lafayette College, treats of the sessile-eyed Crustacea; Amphipoda, which have bodies flattened laterally, and Isopoda, flattened dorso-ventrally. A few species destroy submerged timbers, which they use for food and shelter, and some of the terrestrial Isopoda damage vegetation. But many are helpful as scavengers along the shore. They occur in great numbers and form a large part of the food of edible fishes. The bulletin has descriptions and figures of native forms and a general account of the anatomy and biology of this group of Crustacea.

Bulletins Accepted for Publication.

On account of the abnormal cost of printing and of the desirability of curtailing expenses not connected with the war, no requests for approval of publication of Survey Bulletins were made to the Board of Control during the years 1917-18. Four bulletins previously accepted by the Superintendent have been editorially revised and are now ready for the press. They are as follows:

A Check-list of Insects of Connecticut, by Wilton Everett Britton, will be of value to institutions as well as to individuals in the identification of insects in the State. As Mr. Britton has been assisted in his work of records and identification of species by collectors and specialists in entomology in and near Connecticut, the list, though necessarily incomplete, is believed to be accurate. It has been preceded by Bulletins 16 and 22 of this Survey, which also deal with the insects of the State, and is to be followed by another now in preparation dealing with Hemiptera.

A paper on the Quaternary Geology of the Southern Lowland of Connecticut has been prepared by Freeman Ward. It consists of descriptions of the preglacial, glacial, and postglacial conditions of the New Haven region and also of descriptions of the land formation, composition, and the causes thereof.

A paper has been prepared by Miss Ruth Sawyer Harvey on Drainage and Glaciation in the Central Housatonic Basin. The streams in this basin vary from the normal type and are discussed in relation to their geologic history. A general description of the region centering at Danbury is given from a geologic standpoint.

The Physical Geography and Geology of the Pawcatuck Valley has been prepared by Miss Laura Hatch. Its aim is to give a complete geologic and physiographic description of a region which contains type physiographic and petrographic features. A description of the area about Westerly, Rhode Island, is included.

Arrangements were made in previous years for the preparation of several bulletins which have not reached completion. Their status is as follows:

The Decapods of Connecticut, by A. E. Verrill. The introduction and the systematic portion have been completed, making over 200 printed pages, and 111 illustrations have been prepared. A bibliography is to accompany the report, which otherwise is nearly complete.

Hemiptera of Connecticut. Ten zoölogists, under the direction of W. E. Britton, are contributing to this work, which is nearly completed.

The Bacteria of the Fresh Waters of Connecticut, by H. W. Conn and L. R. (Potter) Hedenburg. The first draft of this work was submitted to the Superintendent and later recalled for extensive revision. At the time of his death, April 18, 1917, the manuscript had not been finished by Professor Conn, and it is unlikely that it can be prepared for publication by another student of bacteriology. Professor Conn is the author of the first scientific report of the State Survey—a paper which has found wide use.

Report on Thames River Terraces, by F. P. Gulliver. The request of the author to be released from his obligations to complete the proposed work on the region about Norwich and New London has been granted.

Peat Deposits of Connecticut, by C. A. Davis, assisted by E. C. Miller and T. T. Giffen. Under the direction of Professor William North Rice, formerly Superintendent of the Connecticut Survey, an investigation of the peat resources of the State was made from July to October, 1907, and continued during 1908, 1909, and 1914. This work was placed in charge of C. A. Davis, the foremost American authority on occurrence and utilization of peat. All the swamps, both fresh and salt water, of the State were studied and the amount and character of the deposits determined by specially devised sounding apparatus. The field work was supplemented by chemical analyses and microscopic studies and by tests of the value of the product as fuel and as fertilizer. It was pioneer work of high grade, and the methods of study developed have been successfully employed elsewhere. At the time of his death in April, 1916, the completed report had been in the hands of Professor Davis for nearly two years awaiting final revision. A thorough but fruitless search for this manuscript has been made. Fortunately, some of the field notebooks and maps remain, but there is little hope that material for publication can be obtained without practically taking up the work anew.

Cooperation with the United States Geological Survey.

During the years 1911 to 1917 the State Geological and Natural History Survey cooperated with the United States Geological Survey in a study of the water resources of Connecticut. During this time, 69 towns, which comprise 35 per cent of the area of the State and include 50 per cent of its population, were surveyed.

The list of towns covered by this investigation is given in Bulletin 27, page 13, of the State Survey. Further work was discontinued on June 30, 1917, for the duration of the war. It is desirable to resume work and complete the investigation in the near future.

By the terms of the contract, the United States Geological Survey assumed responsibility for the prosecution of the work, and Herbert E. Gregory, Geologist of the Federal Survey, was appointed to direct the investigations. The purpose of the series of studies is to determine the position, amount, and quality of the waters—particularly underground waters—of the State of Connecticut and to discuss their economic utilization. The value of such studies depends upon their usefulness not only to communities using a common supply, but to individual landholders, and the preparation of reports has, therefore, involved detailed mapping and local descriptions. The position of ground water with reference to the land surface has been determined, areas of open field, forest, rock, and types of glacial soil have been outlined; water from springs, wells, and brooks has been analyzed; and studies of the most economical and sanitary supplies for farms and villages have been made. By description and discussion in the text, by tabulation of statistics and representation of data on maps and sections, the conclusions of the authors regarding amount, quality, and availability of water supply of each town are given.

By agreement, the results of these investigations of the water resources of Connecticut are to be published as water-supply papers of the United States Geological Survey, and the expense of publication is to be met by the Federal Treasury. Each water-supply paper will bear the title: "Prepared in Cooperation with the Connecticut Geological and Natural History Survey," and the contract reserves the right of the State of Connecticut to publish or republish all or parts of the reports.

The following publications have appeared:

Ground Water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook Areas, Connecticut, by H. E. Gregory and A. J. Ellis. Water-Supply Paper 374, 1916. 150 pp., 13 pls., 10 figs.

Ground Water in the Waterbury Area, Connecticut, by A J. Ellis. Water-Supply Paper 397, 1916. 73 pp., 4 pls., 10 figs.

Water-Supply Paper 374 represents the first systematic attempt to investigate the ground water in the State. The area described covers 715 square miles and includes the towns of Hartford, West Hartford, Newington, Wethersfield, East Hartford, Manchester, Windsor, East Windsor, South Windsor, Bloomfield, Stamford, Greenwich, Salisbury, Canaan, North Canaan, Wind-

ham, Franklin, Saybrook, Essex, Westbrook, and Old Lyme. The aim of the paper is to show how much water is stored underground, how the supply fluctuates, what its quality is, how it can be procured, and how much can be secured from streams.

Water-Supply Paper 397 covers work on an area of about 171 square miles, and includes the towns of Ansonia, Seymour, Oxford, Beacon Falls, Naugatuck, Middlebury, Waterbury, Watertown, Thomaston. This region is rich in good water-power sites and well provided with water for municipal supplies, but the conflicting demands of water users have given rise to local problems of conservation. This report records facts and recommendations on which regulations for the use of water may be based.

These publications and also Water-Supply Paper 232, by H. E. Gregory, Underground Water Resources of Connecticut, which deals with the State as a whole, may be obtained free of charge from the Director, United States Geological Survey, Washington, D. C.

The call for these studies of water resources of the State is somewhat greater than for many similar public documents. The first edition of Water-Supply Paper 232, issued in 1909, was exhausted, and of the second printing 330 copies were in stock on December 1, 1918. Seventy-five copies of Water-Supply Paper 374, issued in 1916, and 100 copies of Water-Supply Paper 397, issued in 1916, were on hand December 1, 1918.

Papers in process of publication are the following:

Waters of the Pomperaug Valley, Connecticut, by A. J. Ellis. (Manuscript in preparation.) This report is based on field work done in 1913 and a series of stream, well, precipitation, and evaporation measurements carried on continuously from May, 1913, to December, 1916, by Ernest W. Parkin, George A. Parkin, and Ralph V. Wooden, under the direction of A. J. Ellis and H. S. Palmer. About 10 per cent of this report has been prepared.

Ground Water in the Meriden Area, Connecticut, by Gerald A. Waring. (Manuscript completed.) This report covers the towns of Meriden, Berlin, Middlefield, Middletown, Cromwell, and Rocky Hill. It includes chapters on the geography and geology of each town and discusses the water supplies in detail under the headings: water in till, water in stratified drift, water in bedrock, springs, wells, quality of water. This report is with the editors awaiting the preparation of the illustrations.

Water Resources of the Cheshire-Granby Area, Connecticut, by Harold S. Palmer. (Manuscript completed.) This report treats of the geography, surface geology, and water resources of the following towns: Cheshire, Prospect, Southington, Wolcott, New

Britain, Plainville, Bristol, Plymouth, Farmington, Avon, Burlington, Harwinton, Simsbury, Canton, New Hartford, Granby, Barkhamsted, and Hartland. This report is with the editors awaiting the preparation of the illustrations.

Ground Waters of the Suffield, Glastonbury, and Norwalk Areas, Connecticut, by Harold S. Palmer. (Manuscript completed.) The towns covered by this report are Suffield, East Granby, Windsor Locks, Enfield; Glastonbury, Marlborough; Norwalk, Darien, New Canaan, Westport, Weston, Wilton, and Ridgefield, which were surveyed in 1916. The report is awaiting editing and approval for printing.

These reports are for general distribution and when published may be obtained free of charge by addressing: Director, United States Geological Survey, Washington, D. C.

The total expense to the State of Connecticut for the six years' investigation of water resources under the cooperative agreement is $6,000. The Federal Government has expended an equal amount in addition to the cost of supervision and administration and the large expense of publication.

It is believed that this work, probably the most exhaustive study of a water-supply problem so far undertaken for a large area, has high value. The publications record basal studies whose results will become more useful as the population increases and problems of water rights and of sanitation become more complicated.

Military Mapping.

Previous to 1917 practically no attention had been given by Federal or State surveys to the organization of geological and geographical information for military purposes. Military mapping, which is a prominent feature of scientific work in European countries, had not been undertaken. The declaration of war in the spring of 1917 called attention to the dearth of information regarding road materials, water supply, the nature of the sea coast, and other geographic matters of large military importance. It was also found that the few American Army officers who possessed the necessary training for geologic work were urgently needed for other duties. To meet the emergency, the Council of National Defense, acting through the National Research Council, undertook to procure for the Engineer Corps of the Army reliable information regarding materials for road making and fortification construction along the Atlantic seaboard, and to make this information available at the earliest possible moment by the preparation of a series of confidential reports and maps covering

the States along the Atlantic and Gulf borders from Maine to Texas. The Superintendent of the State Survey was asked to serve as a member of the committee in charge of this work, and the Survey was asked to assume responsibility for providing the military authorities with desired information regarding Connecticut.

After consultation with the Governor and other members of the Commission, it was decided to undertake this work as a contribution of the State to national needs and to use such part of the Survey appropriation as was necessary for this purpose. Work was begun May 1, 1917, and the completed report and maps were submitted on September 1, 1917. During the three months that the work was in progress, the field force, in addition to the Superintendent, included the following men:

Kirk Bryan, instructor in geology, Yale University, now with the Army Engineer Corps in France, served until called for work on the Mexican border on July 1.

Chester R. Longwell, instructor in geology, Yale University, now Captain of Artillery in France, was in the field from June 18 until called to Plattsburg on August 21.

M. H. Bissell, graduate student in geology, was engaged in field work and drafting from June 1 to September 1.

Malcolm R. Thorpe carried on field work on the islands in Long Island Sound during July and August.

Joseph Barrell, professor of geology, Yale University, was in the field four days in June.

W. L. Barrows, professor of geology at Trinity College, was engaged in the study of gravel deposits from June 1 to July 18.

W. E. Ford, assistant professor of mineralogy in the Sheffield Scientific School, offered his services and began work, but at the request of the committee was transferred to Maine, where his services were much needed.

In addition to the contributions of the Survey field staff, valuable material for the final report was furnished by the Highway Commission, the Connecticut Company, and the New York, New Haven & Hartford Railroad Company. Data obtained by the Survey in the course of its regular work in past years was also utilized.

The estimated cost of the work was $2,500, the actual cost was $788.94. This unexpected saving was made possible by the attitude of Mr. Bryan, Professors Barrows, Ford, and Barrell, and Mr. Thorpe, who rendered service without remuneration, and by the cooperation of the United States Geological Survey and of Mr. Lucius Storrs, president of the Connecticut Company, who furnished expensive base maps.

The report and military map of the Connecticut coast is at present considered confidential, and a description of its contents is, therefore, not permissible. It is kept on file in Washington and has been used by the National Research Council, the Highways Transport Committee, and the Shipping Board. Abstracts have been made by various military departments and State divisions. The report has given rise to considerable correspondence and a number of letters of commendation. Permission has been granted to publish the following:

November 26, 1918.

Professor Herbert E. Gregory, Superintendent,
Geological and Natural History Survey of Connecticut,
Yale University, New Haven, Conn.

Sir:—The War Department has found that the material gathered by the Geological and Natural History Survey forces has been of considerable value as military information in the military mapping program now in process. Particularly has the data been of value on road materials, including existing and possible sites.

Such data should be of great advantage to a military commander in times of emergency, which would require rapid transportation, with the resulting necessity of good military roads in that part of the United States.

Very respectfully,
W. M. BLACK,
Major General, Chief of Engineers
By:
(Signed) E. H. MARKS,
Colonel of Engineers.

Other State Survey Work.

In accordance with the vote of the Commissioners, taken by letter December, 1917, arrangements were made with Dr. George E. Nichols for the preparation of a bulletin on the Ecology of Connecticut, a study of types of vegetation and their distribution with reference to soil, topography, and water. Such an investigation is desirable for scientific purposes and furnishes basal data for reclamation of abandoned lands and utilization of swamp lands. During the past summer one and one-half months were devoted to field work; the remainder of the time at the disposal of Dr. Nichols was required for studies of the occurrence and availability of sphagnum moss suitable for surgical dressings.

A bulletin on the Snakes of Connecticut, for which provision was made by the Commissioners in June, 1917, is being prepared by E. Burlingham Schurr, formerly curator of the Museum of Natural History and Art, New Britain, Connecticut.

The Superintendent has assisted the United States Geological Survey and the War Industries Board in the search for pyrite,

graphite, mica, high-grade clay, and sand for optical glass in accordance with a program for the investigation of war minerals. An unusually large number of inquiries regarding the mineral and quarry resources of the State have been received, and advice has been given to individuals and corporations outside of Connecticut in regard to suitable locations for manufacturing plants which plan to make large use of gravel, trap rock, and clay or peat.

At the request of the Committee on Appropriations and the Board of Control, the Superintendent has acted as adviser to various State commissions in matters relating to selection of sites for buildings, development of water supplies, and location of construction materials. At the request of the Governor he has served as a member of the committee on selecting a site for the proposed new State Prison.

Plans for Future Work.

I. Geology.

The geology and physical geography of Connecticut possess features of unusual interest. The bulletins already published, the Manual of Geology, the Geological Map, Clays and Clay Industries, Triassic Life, and other reports, have been found useful. It is desirable to continue geologic investigation to include other and more detailed studies of areas and special problems. Among the bulletins which should be prepared are the following:

Connecticut during the Ice Age. An explanatory description of the surface deposits, lakes, waterfalls, eskers, drumlins, and other topographic features for which the glaciers of Pleistocene time are responsible. Requests for the publication of such a report have come from teachers and other citizens.

Igneous and Metamorphic Rocks of Selected Areas. The structure and composition of the rocks of eastern and of western Connecticut are exceedingly complex, but the solution of the problems which they present is very desirable as a contribution to the geologic history of the United States. A tentative agreement for undertaking such studies has been made with Professor W. G. Foye of Wesleyan University.

Mineralogy of Connecticut. A descriptive list of the minerals of the State, their occurrence, their geologic relations, and economic value.

Physical Geography. A number of papers of moderate size dealing with the geographic factors concerned with the location of cities, of routes of travel, and the development of industries

would find a useful place. The reports should be made of type localities and eventually combined to form a bulletin on the physical geography of the State. Professor Rice has indicated his willingness to prepare a paper on the Middletown region, and tentative arrangements have been made for the study of other areas.

Feldspars of Connecticut. A bulletin describing the location and extent of feldspar deposits and their availability for commercial purposes.

Road-making Materials. A study of rocks of the State with reference to their suitability for use as crushed stone for road construction and concrete.

II. Botany.

The systematic botany of the flowering plants of southern New England is comparatively well known and a list of flowering plants and ferns of Connecticut has been published by the Survey. Of the flowerless plants, the mosses, liverworts, fungi, fresh-water algæ and bacteria have been treated in Survey reports, which have received high commendation. Work on the Ecology of the State is now in progress. Bulletins on the following subjects would be welcomed by students and investigators:

The Marine Algæ of the Connecticut Shore
The Lichens of Connecticut

The work done in past years on the swamps and the peat deposits of the State by C. A. Davis and others should be taken up anew in cooperation with the United States Department of Agriculture and Federal committees on land reclamation and drainage. There is an increasing interest in these subjects.

III. Zoology.

Bulletins on the birds of Connecticut, on the fresh-water Protozoa, on the Echinoderms, on the Amphipods and Isopods, and two parts of a Guide to the Insects of Connecticut have been published. Professor Verrill reports that his paper on the Crustacea is nearing completion. It is desirable that in future years bulletins should appear on mammals, fishes, reptiles, Amphibia, and on selected species of marine fauna. Their publication is desirable from both educational and economic viewpoints.

Appropriation Desired.

In the last Biennial Report attention was called to the difficulty experienced in conducting the Survey on the meager appropriation granted in previous years, and the conclusion was reached that

> "It will be impossible to continue the work permanently on this basis. To offer a man of high scientific attainments $50 or $100 for an authoritative report on an investigation which may require his unoccupied time for two or three years is to demand a large public service with very little recognition. It is doubtful if the good will of such men as the Survey desires to employ can be treated as an asset for an indefinite length of time under conditions like this. If the work of the Survey is to be carried on in an efficient manner a biennial appropriation of at least $5,000 will soon become essential."

It is a pleasure to state that the views of the Commission met with a sympathetic response. Following a conference with the Committee on Appropriations and the Board of Control, at which the function of the Survey was somewhat fully discussed, an appropriation of $6,000 for the years 1917-19 was recommended and later voted by the Legislature. Because of conditions arising out of the war, care has been taken to reduce the expenditures by eliminating proposed work, by accepting a large amount of voluntary service from individuals, and by cooperation with State and Federal agencies. It is, therefore, not unlikely that a considerable part of the present appropriation will remain unexpended. It is desirable, however, that the scientific and educational problems which come within the scope of the Survey be again taken up and completed. In order to do this the appropriation of $6,000 for the present biennium should be renewed for the years 1919-21.

BULLETINS

OF THE

State Geological and Natural History Survey of Connecticut.

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904.

2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut: by Herbert William Conn. (Out of print. To be obtained only in Vol. 1, containing Bulletins 1-5. Price $1.50, postpaid.)

3. A Preliminary Report on the Hymeniales of Connecticut: by Edward Albert White.

4. The Clays and Clay Industries of Connecticut: by Gerald Francis Loughlin.

5. The Ustilagineæ, or Smuts, of Connecticut: by George Perkins Clinton.

6. Manual of the Geology of Connecticut: by William North Rice and Herbert Ernest Gregory. (Out of print. To be obtained only in Vol. II, containing Bulletins 6-12. Price $2.45, postpaid.)

7. Preliminary Geological Map of Connecticut: by Herbert Ernest Gregory and Henry Hollister Robinson.

8. Bibliography of Connecticut Geology: by Herbert Ernest Gregory.

9. Second Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906.

10. A Preliminary Report on the Algæ of the Fresh Waters of Connecticut: by Herbert William Conn and Lucia Washburn (Hazen) Webster.

11. The Bryophytes of Connecticut: by Alexander William Evans and George Elwood Nichols.

12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908.

13. The Lithology of Connecticut: by Joseph Barrell and Gerald Francis Loughlin.

14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation: by a Committee of the Connecticut Botanical Society.

15. Second Report on the Hymeniales of Connecticut: by Edward Albert White.

16. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton. Part I. General Introduction: by Wilton Everett Britton. Part II. The Euplexoptera and Orthoptera of Connecticut: by Benjamin Hovey Walden.

17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-1910.

18. Triassic Fishes of Connecticut: by Charles Rochester Eastman.

19. Echinoderms of Connecticut: by Wesley Roscoe Coe.

20. The Birds of Connecticut: by John Hall Sage and Louis Bennett Bishop, assisted by Walter Parks Bliss.

21. Fifth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1911-1912.

22. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton. Part III. The Hymenoptera, or Wasp-like Insects, of Connecticut: by Henry Lorenz Viereck, with the collaboration of Alexander Dyer MacGillivray, Charles Thomas Brues, William Morton Wheeler, and Sievert Allen Rohwer.

23. Central Connecticut in the Geologic Past: by Joseph Barrell.

24. Triassic Life of the Connecticut Valley: by Richard Swann Lull.

25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914.

26. The Arthrostraca of Connecticut: by Beverly Waugh Kunkel.

27. Seventh Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1915-1916.

28. Eighth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1917-1918.

29. The Quaternary Geology of the New Haven Region, Connecticut: by Freeman Ward, Ph.D.

30. Drainage, Modification and Glaciation in the Danbury Region, Connecticut: by Ruth Sawyer Harvey, Ph.D. (In press.)

31. Check List of the Insects of Connecticut: by Wilton Everett Britton, Ph.D. (In press.)

Bulletins 1, 9, 12, 17, 21, 25, 27, and 28 are merely administrative reports containing no scientific matter. The other bulletins may be classified as follows:

Geology: Bulletins 4, 6, 7, 8, 13, 18, 23, 24, 29, 30.

Botany: Bulletins 3, 5, 10, 11, 14, 15.

Zoölogy: Bulletins 2, 16, 19, 20, 22, 26, 31.

These bulletins are sold and otherwise distributed by the State Librarian. Postage, when bulletins are sent by mail, is as follows:

No. 1	$0.01	No. 13	$0.08	No. 23	$0.03
3	.08	14	.16	24	.10
4	.06	15	.06	25	.02
5	.03	16	.07	26	.06
7	.06	17	.02	27	.02
8	.05	18	.07	28	.02
9	.02	19	.08	29	.03
10	.08	20	.14	30	
11	.07	21	.02	31	
12	.02	22	.08		

The prices when the bulletins are sold are as follows, postpaid:

No. 1	$0.05	No. 13	$0.40	No. 23	$0.15
3	.40	14	.75	24	.65
4	.30	15	.35	25	.05
5	.15	16	.35	26	.80
7	.60	17	.05	27	.05
8	.20	18	.25	28	.05
9	.05	19	.45	29	.50
10	.35	20	.50	30	
11	.30	21	.05	31	
12	.05	22	2.00		

A part of the edition of these Bulletins have been assembled in volumes substantially bound in cloth, plainly lettered, and sell for the following prices, postpaid:

Volume I,	containing Bulletins 1-5	$1.50
Volume II,	containing Bulletins 6-12	2.45
Volume III,	containing Bulletins 13-15	2.50
Volume IV,	containing Bulletins 16-21	2.15
Volume V,	containing Bulletin 22	2.50

It is intended to follow a liberal policy in gratuitously distributing these publications to public libraries, colleges, and

scientific institutions, and to scientific men, teachers, and others who require particular bulletins for their work, especially to those who are citizens of Connecticut.

Applications or inquiries should be addressed to

GEORGE S. GODARD,
State Librarian,
Hartford, Conn.

In addition to the bulletins above named, published by the State survey, attention is called to three publications of the United States Geological Survey prepared in co-operation with the Geological and Natural Survey of Connecticut. These are the following:

Bulletin 484. The Granites of Connecticut: by T. Nelson Dale and Herbert E. Gregory.

Water-Supply Paper 374. Ground Water in the Hartford, Stamford, Salisbury, Willimantic and Saybrook Areas, Connecticut: by Herbert E. Gregory and Arthur J. Ellis.

Water-Supply Paper 397. Ground Water in the Waterbury Area, Connecticut: by Arthur J. Ellis, under the direction of Herbert E. Gregory.

These papers may be obtained from the Director of the United States Geological Survey at Washington.

CATALOGUE SLIPS.

Connecticut. State geological and natural history survey.

Bulletin no. 29. The Quaternary geology of the New Haven region, Connecticut. By Freeman Ward. Hartford, 1920.

80 pp., 9 pls., 17 figs., 25^{cm}.

Ward, Freeman, 1879—

The Quaternary geology of the New Haven region, Connecticut. Hartford, 1920.

80 pp., 9 pls., 17 figs., 25^{cm}.

CATALOGUE SLIPS.

Geology.

Ward, Freeman. The Quaternary geology of the New Haven region, Connecticut. Hartford, 1920.

80 pp., 9 pls., 17 figs., 25^{cm}.

(Bulletin no. 29, Connecticut geological and natural history survey.)

State of Connecticut

PUBLIC DOCUMENT No. 47

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HERBERT E. GREGORY, SUPERINTENDENT

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1920

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THE QUATERNARY GEOLOGY

OF THE NEW HAVEN REGION, CONNECTICUT

By

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INTRODUCTION.

Among the papers listed in the Bibliography of Connecticut Geology (State Geological and Natural History Survey Bulletin 8, 1907) are many relating to glaciation. Most of them deal with Connecticut as a whole or with principles illustrated by glacial phenomena within the State. The present report is the result of the study of a relatively small area and is based on field observations made in 1909 and 1910, supplemented by material taken from a thesis presented to Yale University.

The work, both in field and office, has been under the direction of Professor Herbert E. Gregory, of Yale University, to whom the writer is indebted for valuable criticism and expert advice. Acknowledgments are also due to Professor L. V. Pirsson and Professor Joseph Barrell, of Yale University, whose generous suggestions were of great benefit. The services rendered by many people who furnished valuable information concerning wells and excavations are also thankfully acknowledged.

THE QUATERNARY GEOLOGY
OF THE NEW HAVEN REGION, CONNECTICUT

LOCATION.

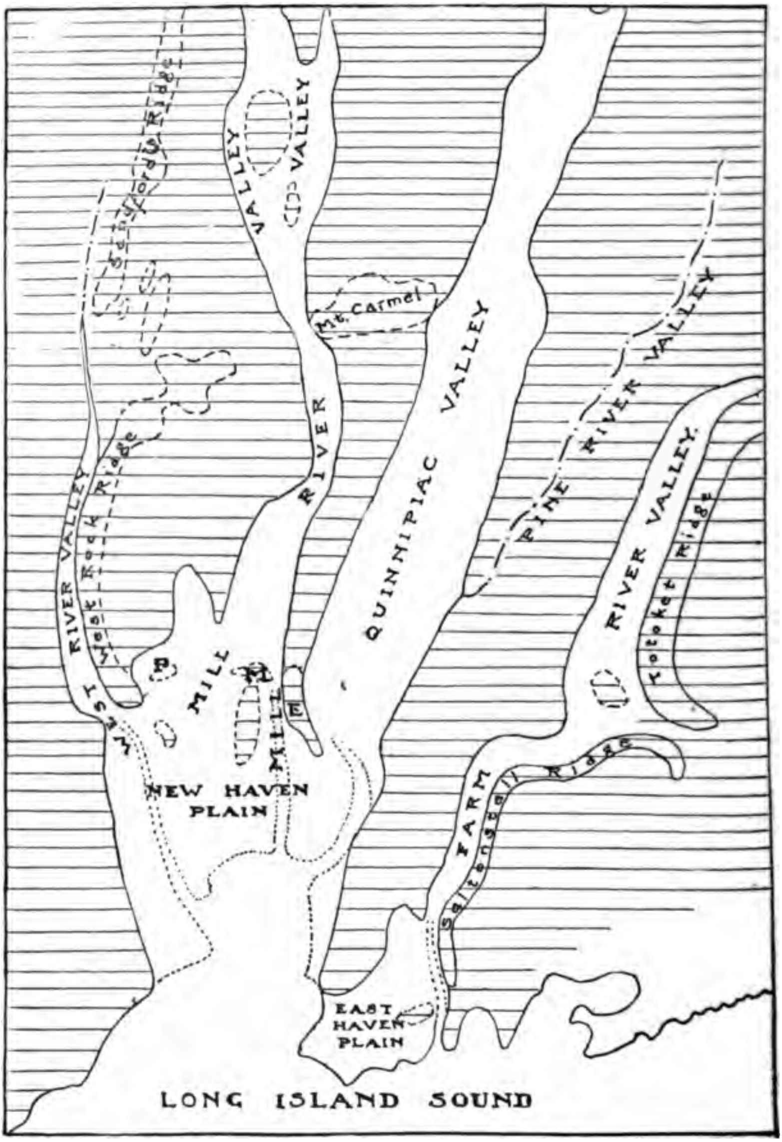
he area described in this report is located in the south central of Connecticut bordering Long Island Sound and extending d. The city of New Haven and its environs are in the ern part of the area; the towns of Cheshire and Yalesville ear its northern border. The length of the area north and is about 18 miles, and its width east and west ranges from 12 miles, the whole area comprising most of the region em-d in the New Haven sheet of the Topographic Atlas of the d States. The region belongs to the central lowland,[1] a of Connecticut characterized by lower altitude and general relief than the highland area, and by the presence of the sic formation (sandstone, shale, and trap rocks). A small of the highland underlain by crystalline rock is included.

TOPOGRAPHY.

VALLEYS.

s shown in figure 1 and Plate I (p. 79), the southern of the central lowland is roughly divided into four north and strips by the valleys of West River, Mill River, Quinnipiac , and Farm River. The largest valley, the Quinnipiac, es with the West and Mill valleys in the flat New Haven which stands but 40 to 60 feet above sea level. Similarly,

[1] e, W. N., and Gregory, H. E., Manual of the geology of Connecticut: ticut Geol. and Nat. Hist. Survey Bull. 6, p. 17, 1906.



= Uplands E = East Rock. P = Pine
= Lowlands M = Mill. S = Mt. Sandford.

Fig. 1. Map of uplands and lowlands in the New Haven region.

Farm River valley at its lower extremity spreads out into the East Haven plain. All these valleys carry tidewater streams for at least 2 miles, and the Quinnipiac River is affected by the tide for a distance of about 8 miles, to a point beyond North Haven. Inland from the tidal limit the floor of the Quinnipiac Valley holds its low position to a point beyond Yalesville where the 100-foot contour is crossed. The other rivers have a somewhat steeper gradient. Mill River reaches the 100-foot mark at Mount Carmel, and Farm River at Totoket. West River is flowing at an elevation of 100 feet near Lake Dawson and at 200 feet a mile and a half above the lake. From this point the valley rapidly steepens, and the headwaters opposite Mount Sandford start from the 700-foot contour. The narrow valley and steep gradient of West River in the upper part of its course are to be contrasted with the broad, flat floor in the lower part of its course. The Mill, Quinnipiac, and Farm rivers have broad, flat floors throughout their entire extent. The slopes of the valleys may be expressed in the following figures based on approximate measurements: the Quinnipiac drops 100 feet in a distance of 15 miles; Farm and Mill rivers drop 200 feet in 14 miles; West River drops 500 feet in the first five miles from its source and 200 feet in the remaining 8 miles of its course. A less prominent river and valley, Pine River and its northern extension, occupy a position between the Farm and Quinnipiac valleys and flows into the Quinnipiac by the way of Five Mile Brook.

Throughout much of their extent these valleys are more or less terraced.

RIDGES.

The ridges and uplands shown on the map (fig. 1) include the prominent topographic features: West Rock Ridge, Salstonstall Ridge (Pond Rock), Totoket Ridge, East Rock, and Mount Carmel.

Starting at Westville (New Haven), West Rock Ridge extends northward beyond the New Haven area. For about 6 miles in the lower part it lies in a broad curve which is connected by several small ridges with a similar ridge to the north having

Mount Sandford for its highest point. The southern end of West Rock Ridge (known locally as West Rock) rises abruptly from the New Haven plain to a height 405 feet above sea level. North of West Rock the ridge has a sharp cliff-like front facing West River valley and a gentle slope to the east. Its elevation increases; a height of 485 feet is reached near Lake Wintergreen, 670 feet near Bethany Notch, and 700 feet beyond the notch. The ridge of which Mount Sandford is a part presents a steep front to the east, rises abruptly 450 feet above the contiguous valley floor to the north, and merges into the highland to the west. Mount Sandford, which is not only the highest point on this ridge but in the whole area, attains an altitude of 920 feet above sea level. The highest ridge between West Rock Ridge and Mount Sandford reaches a height of 820 feet.

Saltonstall and Totoket ridges, rising abruptly from the Farm River valley, are arclike in form with chords about 5 miles long. Saltonstall Ridge is 220 feet in elevation at its southern end (Beacon Hill), 240 feet at about its middle point, and 245 feet near its northern end. Totoket Ridge has an elevation of 340 feet near North Branford and rises gradually toward the north to 600 feet near Northford. Like West Rock Ridge, Totoket presents a steep front to the west and a gentle slope to the east. On Saltonstall Ridge the slopes are more nearly uniform both east and west.

On the divide that separates the Mill and Quinnipiac valleys are two prominent topographic features, Mount Carmel and East Rock. The waters of these two valleys are not more than three-quarters of a mile apart at a point about a mile and a half from their mouths, but the intervening divide is the abruptly rising East Rock Ridge which has a maximum height of 359 feet above sea level. East Rock and its companion elevations, Mill Rock and Pine Rock, form an interrupted transverse ridge with a general east and west trend, unlike most ridges of this region. Mount Carmel is another transverse ridge and is not only more massive than East Rock Ridge but is more than twice as high — 737 feet. It spans the distance between Quinnipiac River and Mill River which are here nearly three miles apart.

A, Hills rounded by glacier. Looking northwest towards eastern portion of Mount Carmel, Conn., across *roches moutonnées* covered with 1 to 4 feet of till.

B, Trolley cut near Fort Hale Park, New Haven, Conn., showing till in section. (See analysis 1, p. 15; sample taken to right of big bowlder.)

UPLANDS.

Land averaging from 100 to 400 feet in height, characterized by broad, gentle slopes rising from the valleys, makes up most of the New Haven area. Examples of such uplands are found on the divide between East Rock and Mount Carmel, in the district north of Mount Carmel, on the slopes bordering West Rock, Sandford, and Totoket ridges, in the uplands north and south of Wallingford, and in the highland area bordering West River valley on the west. The upland area is quite well drained by small streams and brooks, the largest of which is only a few miles long. A few lakes and many small swamps dot the slopes, hollows, and valley floors. Along the coast as well as on the lower flats of the rivers are wide expanses of salt marsh.

One feature common to all ridges and hills is the smoothness of their profiles. No pointed peaks or saw-tooth ridges exist, and although some of the ridges present steep cliffs on one side, their tops are always rounded. Plate II, *A*, shows the undulating, rounded appearance of the hills and ridges of this part of Connecticut. (See also the smooth profile of West Rock Ridge, as shown in Plate III, *B*.)

GLACIAL DEPOSITS IN GENERAL.

Quaternary time, the last great period of geologic time, was characterized by the presence of ice sheets over many lands within the Temperate Zone. Early Quaternary time is, therefore, often spoken of as the "Glacial Period" or the "Ice Age," and the time which has elapsed since the retreat of the glaciers as "postglacial." In geologic terms the glacial period is Pleistocene time and postglacial is Recent. The entire State of Connecticut was buried under ice during the Pleistocene, and these ancient glaciers are responsible for much of the natural scenery of the State.[1] In the central lowland, glacial deposits are extensive

[1] It is not within the scope of this report to discuss the work of glaciers or causes of glacial periods. For general discussion readers are referred to standard text books. For glaciation in Connecticut see Rice, W. N., and Gregory, H. E., Manual of the geology of Connecticut: Connecticut Geol. and Nat. Hist. Survey, Bull. 6, pp. 225-259, 1906; and Gregory, H. E., Bibliography of the geology of Connecticut: Idem, Bull. 8, Nos. 29, 31, 33, 38, 41, 56, 58, 64, 1907.

and assume a variety of forms. They are described as *drift* or *glacial drift,* which includes all of the loose rocky débris (sand, gravel, clay, bowlders) moved and deposited by glaciers of Pleistocene time. The drift consists essentially of two types of materials called *till* and *stratified* (or modified) *drift.*

Till is that part of the drift which has been carried on and in the ice of the glacier or pushed along beneath it, coming to rest only when the ice melts; it is ice-carried and ice-laid material. Till, therefore, is dropped in irregular heaps and is not arranged in layers, beds, or strata. Stratified drift is that part of the drift which has been carried by the waters of the melting glacier ice, just as sand and gravel are carried by streams and floods; it is water-carried and water-laid material. The suspended matter comes to rest whenever the velocity of the moving water is checked. Stratified drift is dropped in a regular manner, forming layers, beds, or strata.

In most parts of the south-central lowland of Connecticut these two portions of the drift are distributed with some regularity (see Pl. I, p. 79). Stratified drift is usually found in the broad valley portions of the area and till on the uplands.

As its load was dropped wherever the ice melted, and as the glacier is known to have overridden the whole country, till could have been deposited on hill or valley; stratified drift, however, could not be formed everywhere, as sorting and deposition of its materials would depend on water, which moves along certain runways, accumulates in certain basins, and behaves in a regular manner according to the laws of fluids. The load, therefore, that water carries could be deposited only at such places as the water is able to reach. Hence, the great part of a glacial problem is to explain the position and character of the stratified accumulations.

TILL.

SURFACE DISTRIBUTION.

An examination of the map (Pl. I) shows that, in general, till forms the surface of the uplands. The map also shows that some places of relatively high elevation are occupied by stratified deposits, for instance,— near Westville, about a mile northwest of

Centerville, west of Mount Carmel, northwest of Brooksvale, and near Wallingford. The opposite is also true — that many of the valleys of the uplands are lined with till instead of stratified drift, though some have a narrow strip of stratified material along their floors. Such accumulations are too small to be represented on the map. Till also occurs on low knolls in the midst of valley or plain deposits, as at Beaver Hill, New Haven, and the hill half a mile east of the North Haven railroad station.

Till is commonly found covering the uplands and hilltops and spreading down the slopes until it meets the stratified deposits of the broad valleys or plains. The point of juncture is usually at the general level of the valley floor; in some instances till may reach a lower level than stratified deposits (see fig. 2, *B*). Till of bare bedrock will be found where stratified drift is absent.

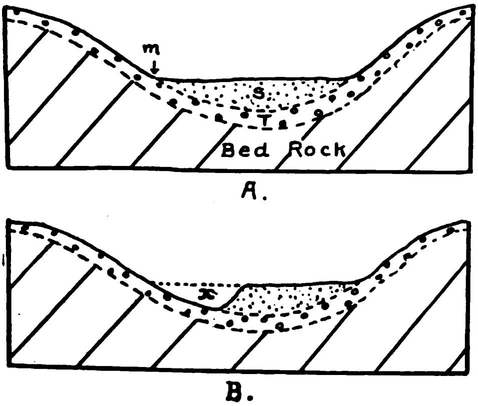


Fig. 2. Cross sections showing: *A*, Position of till with relation to stratified drift. *B*, The same after erosion.

EXTENT BENEATH THE SURFACE.

The entire extent of till is not represented by its total surface area, for in many places instead of stopping abruptly upon meeting stratified drift it passes on beneath (see figs. 2, 6, 7). Till, in turn, usually rests upon bedrock, although in a number of places it is not found beneath stratified drift. Again, it is occasionally found to contain small layers or lenses of stratified drift.

The depth of till ranges from a thin layer to 100 feet, possibly in some places, which have not yet been found, being even thicker. At fully 60 per cent. of the places examined till was found to be 10 feet deep or less, and 10 per cent. of the places showed a depth greater than 40 feet. It is common to find hill after hill upon which the till mantle ranges from 1 to 4 feet in thickness, and such hills may be described as *roches moutonnées* covered with a thin layer of till (see Pl. II, *A*).

The accepted theories of the habits of glaciers explain the main facts so far outlined. A glacier, moving over the land, scraping and gathering débris on all sides from the rocky floor over which it passes, carries along its load of mixed material until the ice melts, when the load is dropped, without sorting, on upland and lowland alike and thus forms the general till mantle. The débris is not dropped uniformly everywhere, primarily because the ice was irregularly loaded, also because the rate of the melting of the ice varies locally. Hence the depth of the till varies. Upon melting and receding, the ice forms an abundant supply of water which passes over the till, erodes, transports, and modifies it. The load so gathered by the waters and spread out in a regular manner along the main trunk channels is known as stratified drift. It may be deposited on top of till which lines the channels, or the till may be eroded or entirely removed by the streams and stratified drift laid directly on the bedrock. Hence it is that till is spread widely over the land and stratified drift rests upon it in certain places.

Normally the surface outcrops of till are at a higher elevation than those of stratified drift; but along some portions of the valleys which hold stratified drift, till has a lower position at the surface than stratified drift, as shown in figure 2. Stratified drift has naturally been spread over the valley to a uniform height in the first instance, as is indicated in figure 2, *A*. Erosion subsequent to deposition has removed a portion of this material, starting at the side, *m*, and stripping back the looser stratified drift from the relatively more resistant till. In figure 2, *B*, the portion, *x*, has been removed so that the lowest part of the valley is till instead of stratified drift.

Wherever stratified drift is found within the main body of till

— that is, a layer of sand only a few feet thick with till below and above — it does not necessarily mean that the first till was laid down as described above, then a thin layer of sand spread out, followed by a second overriding of the ice with a second load of till; for these sand layers are too thin, lenslike, and local, and the sand is not packed solidly enough to give evidence of the overriding of a glacier. It must have been true that during the time the till was being dropped there was always a certain amount of water present. The glaciers of the present day, continually melting in both their advance and retreat, support this conception. So, if the conditions are right, some stratified drift may be intermingled with the accumulating till in small amounts. The most favorable of such conditions are found along the thinning margin of a waning glacier. Here, by the melting of the retaining ice the one-time englacial drift has become superglacial drift, which ordinarily rests on ground moraine, but in some instances is separated from it by sheets of thin ice. This ice would most likely be spongy enough to allow water laden with fine débris to sift through and would in time be replaced by a layer of sand bounded both above and below by till. A less probable condition might exist where seams, shear planes, or joints have developed in the till because of differential movement due to overriding. These planes might later serve as paths along which water could move and either work over the material in place or introduce fine detritus from without, or both, thus forming a thin sheet of sand within the main body of till. Other explanations for the appearance of small lenses of stratified drift within till are possible.

COLOR.

The color of till is either brown, yellowish, ochre-brown, or some shade of dark or brownish red, a color similar to or the same as that of the red sandstone of the New Haven region. In places where both of these colors are present in section, the yellow-brown portion is always uppermost and grades downward to the red-brown through a transition zone usually less than a foot wide. The plane of separation is not marked by weathering or erosion channels or other evidences of a time interval. The color

of till determines the color of the soil — yellowish, less commonly reddish, or darker shades when mixed with humus. The surface color of the till, then, is dark brown, very often with a yellowish, less commonly with a reddish, tone. But color can not be used as a means of distinguishing till from stratified drift, for both may have similar tones.

The colors of till can best be explained by considering the process of weathering. The red color of the lower till and of the red sandstones and shales is due to the presence of numerous small stains and coatings of ferric oxide — the mineral, hematite — which is reddish in color. On weathering, hematite changes to hydrated ferric oxide — the mineral, limonite (yellow ochre) — which is yellow-brown in color. It is believed that till was originally reddish in color from top to bottom and that in the normal process of weathering the upper portion was the first to change to yellow, the depth of the change depending on the ease of weathering and the time involved since the process started. As a result, the thickness of yellow-brown till overlying red-brown varies, and a sharp line of division can not be drawn. The fact that yellow till is less compact than red till is due to the loosening effect of weathering. The inference that red till is derived from red rock is borne out by field evidence. In till that is only a short distance from the sandstone area the color distinction between the upper and lower portions is not well marked, and in till well within the area of crystalline rocks the color distinction does not exist.

Two other less satisfactory explanations of the two colors follow: (1) The lower red-brown material is considered as ground moraine and the upper yellow-brown as englacial drift. The ground moraine consists largely of local material — red sandstone and shale. The englacial drift consists of a great variety of rock fragments, some local and some foreign, producing a mixture giving to the whole a neutral yellow tone. The overlying englacial material is also less compact than the underlying ground moraine. But the materials of the two portions of till are not enough different to make this theory plausible. (2) The two colors are taken to represent two periods of glaciation, the red-brown till accumulating first and the yellow-brown last. The objection to this theory is that wherever the two are seen

together there is no independent evidence of a time interval. It is, of course, possible that there were two advances of the ice. If so, the interval between them must have been short, or if it was long then the second advance removed all records of the interglacial interval, at least at the places where the two portions are now exposed to view.

STRUCTURE.

The structure of till is very characteristic. It consists of large and small fragments indiscriminately mixed. There is no stratification. In some places, however, till exhibits indistinct, parallel bands, consisting of overlapping, lens-shaped, layer-like groupings of the material in a roughly horizontal position. The name *laminated till* has been given to till with this structure (see fig. 3). Although the structure planes are not always apparent in a fresh exposure, a few days' weathering may bring them out; but even in the best exposures they may not be distinct enough to be seen

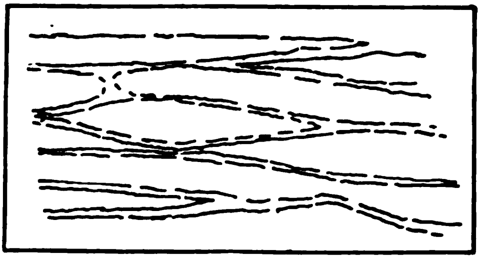


FIG. 3. Cross section of laminated till.
(Natural size.)

beyond the distance of a few yards. This structure is probably the same as that described by Geikie.[1] And the term "foliation" used by Chamberlain and Salisbury[2] probably refers to the same thing.

Such till in this region is commonly if not always reddish in color and quite sandy: it is very compact and has a rough cleavage parallel to the general trend of the lamination. If both yellow-brown and red-brown till are present in section it is the red

[1] Geikie, Archibald, Textbook of geology, 4th ed., p. 547, 1903.
[2] Chamberlain, T. C., and Salisbury, R. D., Geology, vol. 3, p. 342, 1906.

that is laminated. Lamination was observed at only six or eight localities, all near New Haven, but since this structure never appears at the surface it may be present in many other places.

The parallelism and extremely compact make-up of the laminae can satisfactorily be accounted for only by the pressure of overriding ice. The lenslike form of the bands, their small extent, and their overlapping show that this structure has been imposed on till and is not a regular feature of deposition. The glacial movement indicated by this structure was not probably a country-wide re-advance of the ice, but only a minor movement due perhaps to seasonal changes or to local differential shifting.

The structure of till is thus seen to be radically different from that of stratified drift and is the chief means by which the two are differentiated.

TEXTURE.

The term, texture, has reference to the sizes of the various particles, the proportion of each size present, their shape, and the manner in which they are packed. Till consists usually of stones, pebbles, and bowlders held in a fine-grained and clayey matrix and on this account is often called bowlder clay. In many parts of the United States one prominent difference between till and stratified drift is the clayey nature of the one and the sandy nature of the other. Although some clayey till is found in southern Connecticut much of it has a decidedly sandy matrix. This makes the till feel gritty rather than smooth to the touch. Roads passing through such till are sandy in dry weather and but slightly sticky in wet weather. At Gaylord Farm the till is coarse-textured enough to be successfully used as a sewage filter, and it could be similarly used in many other places. The mechanical analyses listed in the table below will show this point more exactly. The analyses made were of materials less than 6 millimeters in diameter after all the larger fragments had been screened out; particles less than 2 millimeters in diameter were determined by the beaker method. The finest particles — silt and clay — have diameters 0.05-0 millimeter. Analyses 1 and 2 show a small quantity of clay, 3 a little more, and 4 approaches the kind of till which is generally considered as typical.

A, Glacial erratic, Judges Cave, West Rock Ridge.

B, Valley filling of stratified drift meeting the steep valley wall abruptly. West River valley and West Rock Ridge.

Mechanical analyses of till.

Diameter of particles	1. Per cent	2. Per cent	3. Per cent.	4. Per cent
6-3 mm.	7.2	3.88	.56	4.7
3-2 mm.	8.8	5.12	1.00	3.3
2-1 mm.	17.98	20.20	3.94	6.44
1-0.5 mm.	17.47	18.28	8.46	6.80
0.5-0.25 mm.	8.57	9.10	6.89	4.41
0.25-0.05 mm.	28.56	32.94	64.97	45.26
0.05-0 mm.	11.34	10.37	14.17	29.06
	99.92	99.99	99.99	99.97

Places from which samples were obtained.

1. Trolley cut near Fort Hale Park, New Haven. See Plate II, *B*.
2. Old quarry along Forest Street, near end of Oak Street, New Haven.
3. Tunnel cut, Shore Line Railroad, New Haven.
4. Cut along road near East Wallingford.

According to the table used by the Bureau of Soils[1] that part less than 2 millimeters would be classed in 1 as "Coarse Sand," in 2 also as "Coarse Sand," in 3 as "Fine Sand," and in 4 as "Fine Sandy Loam." This till is found in many places in the area and on account of its sandy nature may be confused with the stratified drift, unless more distinctive characteristics are taken into consideration.

The sandy nature of some till is readily understood from its local origin (see p. 26). A large part of the south-central lowland of Connecticut is underlain by sandstone, and since ground-up sandstone makes up so large a part of till, it would naturally be sandy.

Great variation is found in the size of fragments whose diameters are greater than 6 millimeters; practically any size may be found up to huge masses weighing many tons. The term "glacial erratics," or simply "erratics," is given to such bowlders (see Pls. II, *B,* and III, *A*). Those exceeding 10 feet in diameter are not common, but bowlders 4 to 8 feet in diameter or less are

[1] Soil Survey Field Book: U. S. Dept. Agr. Bur. Soils, pp. 17, 18, 1906.

abundant. In many places till is so charged with these large rock fragments that agriculture is seriously interfered with or even prevented. Stone fences, a common sight in till regions, represent the efforts of farmers to clear their fields. Erratics are not commonly found in areas of stratified drift.

The texture of till is compact as far as the packing of the particles is concerned, in this respect differing decidedly from the stratified drift. The sides of excavations in till will hold their position for weeks, some even for years. Excavations in stratified drift require the use of planks to prevent slumping. Till usually has more body than sand, without being noticeably solid. It may be so compact as to offer considerable resistance to a shovel and pickax, and some well diggers have even resorted to explosives. The term "hardpan" is particularly appropriate to this sort of till. Laminated till is always compact, though it may not appear so at the surface.

This compact texture may be due partly to the presence of a cement, but out of about a dozen trials to detect cement only in one instance was there a slight effervescence with cold acid. In some cases where wells were dug with difficulty in very compact till, the loosened material thrown to one side has readily "hardened" or "set" again, and though this result might be caused by the development of a cement on exposure to the weather or a reworking of the original cementing material, it is probably ordinarily due to the presence of clay which hardens on drying. Clay as a binding material has been especially effective when till has been subjected to pressure, such as that exerted by the movement of the ice. Since pressure and clay content varied, different degrees of compactness resulted. Some sandy till, however, is very compact, so that though the clay content is not necessarily the controlling factor, a small amount of it mixed in with the finest sand and silt particles may serve to bind the mass.

The shape of the particles, particularly those more than half an inch in diameter, is characteristically angular or subangular. Many of the large fragments retain the same shape they had when torn from the parent ledge; many have been modified by the wear and tear incident to transportation. The modification of shape consists of faceting, that is, development of flat planes or faces on

one or more sides due to continuous grinding or rubbing in one position. The facets are often scratched or striated. In these characteristics the fragments of till differ from those of stratified drift, which are more nearly round. A few examples have been found in the south-central part of Connecticut of rounded fragments of till whose presence and formation are explained by the advance of the glacier over a district already containing water-worn, stratified material. The shape of grains less than 2 millimeters in diameter that make up the matrix is not so angular as that of the larger pebbles. The smaller grains (2 millimeters or less) are made up almost entirely of mineral rather than rock fragments (p. 27). The mineral fragments, chiefly angular and rounded pieces and chips of quartz and feldspar, of till and of stratified drift are much alike. It is, therefore, very doubtful if the two kinds of deposits could be differentiated by the shape of grains less than 2 millimeters in diameter alone, surely not when the size is 0.5 millimeters or less. The larger fragments of rocks, however, do show differences in shape, those in till being markedly more angular than those in stratified drift.

The shape of the fragments depends on the manner in which they were carried. Those that were carried in the ice and so not ground or bruised have retained their original shape, usually angular. Those that were in the ground moraine, especially, were rubbed one over the other and against the bedrock; as a result they may lose some of their angularity — becoming subangular, striated, scratched, or faceted in the process. Fragments that have lain on the surface since the final departure of the glacier may have their angularity reduced and their striations obliterated by weathering.

COMPOSITION.

The kinds of rock in till are various. In the New Haven region about fifteen different varieties have been found, namely, sandstone — coarse, fine, shaly; trap — coarse, fine, amygdaloidal; quartzite; granite — two or three kinds; gneiss — two or three kinds; chlorite schist — two kinds. Of these, sandstone and trap predominate decidedly, not only in general distribution but also

in quantity in any one locality; and as a whole more sandstone is found than trap. Quartzite is present practically everywhere but not in any quantity. Granite and gneiss are fairly common but in small amounts. Chlorite schist is found only in till west of New Haven.

Some of the material has traveled far. Gneiss and quartzite bowlders that are known in places 20 to 50 miles to the north and east have furnished fragments, and the erratics composing Judges Cave are believed to have come from a ledge near Meriden — a fifteen-mile haul for the glacier. But by far the greater quantity of the till material is of local origin and has traveled only two or three miles; much of it only a few hundred yards. This explains the preponderance of sandstone and trap, for they make up the bedrock. The only place where granite fragments predominate is in till that rests on granite ledges in East Haven. Chlorite schist is found in till only in places where schist exists as bedrock. The change from sandstone and trap-laden till to granite or chlorite schist-laden till occurs abruptly within half a mile or less. That till is commonly of local origin is shown also by the composition of the matrix. Till resting on a sandstone ledge was found to carry bowlders and cobbles in the following estimated proportion: sandstone, 60 per cent.; trap, 35 per cent.; quartzite plus x, 5 per cent.; in the matrix, of fragments less than 6 millimeters and greater than 3 millimeters, trap made up only 6 per cent. by weight; of fragments less than 3 millimeters, it was even more rare and was entirely absent as fragments less than 0.5 millimeters. Till resting on chlorite schist not far from sandstone showed the following estimated proportions: chlorite schist, 50 per cent.; sandstone, 30 per cent.; and quartzite plus x, 20 per cent.; in the matrix of fragments less than 6 millimeters and greater than 3 millimeters only 17 per cent. by weight was sandstone; in sizes less than 3 millimeters sandstone rapidly diminished and was lacking in sizes less than 0.5 millimeters; but the chlorite schist was abundant even in sizes less than 0.25 millimeters.

A further study of the matrix showed that as the material becomes finer the rock fragments tend to disappear and the mineral fragments to increase, that is, the rock seems to be re-

duced mechanically to its simpler elements by the grinding occasioned by transportation. In this process the harder minerals persist and are segregated, and the softer ones drop out. Probably the process is not entirely a mechanical one, however, chemical solution and decomposition acting as well, and particularly is this true of feldspar, the small fragments decomposing more rapidly than the large. Fragments 0.25 millimeters in size contain chiefly quartz, some feldspar, a little magnetite, garnet, etc., and in some cases (as above) — if fine-grained rock is the local material and was originally present in large amounts — rock fragments.

The following tables illustrate the relation of the composition of till to location and size of constituents. The percentages are estimates and serve to show the relative amounts of the materials.

Till resting on sandstone ledge.

Materials / Sizes	6-3mm.	3-2mm.	2-1mm.	1-.5mm.	.5-.25mm.
Quartz	15%	35%	55%	70%	75%
Feldspar	9	20	25	25	20
Sandstone	70	41	19	5	0
Trap	6	4	1	0	
				+magnetite	5=magnetite, garnet, etc.

Till resting on chlorite formation.

						.25-.05mm
Quartz	30	47	60	67	75	80%
Feldspar	12	24	20	18	15	10
Sandstone	17	8	5	1	0	0
Chlorite Formation	41	21	15	14	10	9
					+magnetite	1=magnetite, etc.

The quartz in the second table was not entirely derived from the breaking down of the sandstone. An unknown amount was derived from the chlorite schist which is threaded through with quartz. In the larger sizes a few of the quartz grains were seen still to have chlorite clinging to them.

MORAINES AND DRUMLINS.

Moraines are made up of till accumulated under special circumstances. Terminal moraines are formed by a glacier at the time when waste by melting balânces the forward movement. The load of débris is constantly carried to the lowest point and dropped there, forming hills, knolls, ridges, and depressions along a band of varying width and length. The general trend represents the position of the ice front.

Associated with terminal moraines are stratified deposits called kames, formations resulting from the great volume of water produced by the melting of glacier ice. Sometimes water pours out in torrents just in front of a terminal moraine, washes and works over till to make roughly sorted mounds of gravel and sand. In many places kames indicate terminal moraines nearby which might not otherwise be prominent.

Terminal moraines in the true sense of the word are lacking in the New Haven region. In some places, however, many bowlders are segregated and though they do not have an alignment suggestive of a former ice front, they probably indicate a slight halt in the ice movement. Kames, which are usually associated with terminal moraines, occur in three places: a mile northwest of Centerville, less than a mile northwest of Brooksvale, and about a mile west of West Cheshire. Some of the fields of segregated bowlders are back of the kames, but they show no linear extension in any direction. The three sets of kames near Centerville, Brooksvale, and West Cheshire are separated by areas of excessive till accumulation. This suggests that the ice made three halts. If they are moraines they are interpreted as recessional moraines. Just north of this area, at Southington, a moraine is reported that probably represents an important halting spot of the glacier.

The segregations of bowlders in some places may be explained without assuming a halt in the retreat of a glacier, especially where they are segregated in valleys. The force of the stream working on a till deposit may be sufficient to remove only the finer materials so that the bowlders must collect along the new erosional floor of the valley.

A drumlin is a smooth, lenticular hill 50 to 200 feet high and half a mile to 1½ miles long, and is composed of till. Its longer axis is parallel to the ice movement. Of the less than a dozen drumlins seen in the New Haven region, most are in the southern part. Some cases are doubtful because not typical. The hill at North Haven and several hills west of West Haven are considered drumlins. More common are the "drumloids"— rounded elongated ridges, drumlin-like in shape but having rock cores. These few, rather obscure examples of drumlins throw no light on the theory of drumlin origin, that is, whether they are "sand bars" of an overloaded glacier, or whether they are remnants of a thick till mantle partially eroded by advancing ice — *roches moutonnées* of till.

RELATION OF TILL TO STRATIFIED DRIFT.

Till underlies stratified drift and so must be older. An exception to this usual relationship is found in two places where till overlies stratified drift — (1) between West River valley above Westville and Maltby Lakes (see fig. 4); (2) about a mile west of Mount Carmel. These formations may possibly be explained by a re-advance of the ice which resulted in a deposit of till upon stratified drift. The fact that the stratified drift beneath the till is broken and crumpled is a point in favor of this hypothesis. On the other hand, the tiny faults in the stratified drift show no definite relations to the direction of the glacier movement, and the small folds pitch in all directions. In a few places sand with till upon it is undisturbed, and the two types of deposit grade into each other. A more serious objection to the theory of glacier re-advance is the small number of places where till is known to overlie stratified drift. An explanation taking cognizance of ice gorges or dams with consequent ponding of water is more satisfactory. A temporary lake formed in the space between a dam at the lower end of West Rock Ridge in the Westville region and a dam reaching from the west end of Mount Carmel to the uplands to the west in the Mount Carmel region would make possible deposition of stratified material at high levels. On top of the stratified material, floating ice would drop a heterogeneous mixture of cobbles, bowlders, and sand heaped down in large

enough quantities to prevent sorting and hence resembling normal till. The running aground of large ice blocks — even their weight alone — would cause irregularity and a bending and twisting of the layers of stratified drift. The blocks striking bottom alone would disturb the underlying beds.

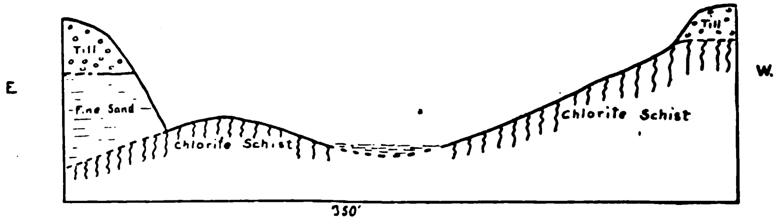


FIG. 4. Section showing till overlying stratified drift at site of dam, Marvel Wood, near New Haven.

This theory would explain the graduation between till and stratified drift already referred to. In the depression of the uplands along which lie Maltby Lakes and the pond at Westville there are spots of stratified drift, some of which are overlain by till (see fig. 4). The existence of a dam at the lower end of West Rock would help to explain the high-level stratified drift, for such a dam would naturally direct the excess water along this channel.

The absence of shore lines marking the position of the ponded water can be explained upon the supposition that the time was too short for their development or that subsequent erosion removed or obscured them.

STRATIFIED DRIFT.

DISTRIBUTION.

The map (Pl. I) shows the distribution of stratified drift. In the main it is restricted to low, flat areas — the broad valleys, the margins of the shore, and the plain on which the city of New Haven is built. In the New Haven plain the West, Mill, and Quinnipiac River valleys meet at a common level. Farm River valley meets the East Haven plain at a slightly lower elevation than the New Haven plain, of which it may be considered a dis-

connected part. From this common level, and passing inland, each valley floor is seen to rise gradually and each at a somewhat different rate.

Stratified drift occupies the lower portions of the region, and it has uniformly low relief, many parts being absolutely flat. This is in contrast to the ice-laid till which in the nature of the case tends to be in irregular mounds, or whose outline, where spread evenly, is determined by the contour of the rocky floor beneath. The only parts that present steep slopes are the terrace fronts.

ORIGIN.

As compared with the haphazard accumulation of till the distribution and arrangement of stratified drift follows a definite scheme. A glacier continually wastes away by melting. The amount of water given off from a glacier even in the vigor of its largest extent is considerable, and at the time of its waning, when melting is especially pronounced, the amount produced is tremendous.

Wherever this water is in motion it is always doing active work, it cuts into the previously deposited till and washes away a certain amount which is dependent on the volume and velocity of the current. If till is lacking and bare ledge lies in its path, the water will attack it. At every step of its progress the water loosens and gathers sand, gravel, clay, etc., and carries along with it a load of this material commensurate with its strength. Thousands of small streams are formed, and as they move down the slopes neighboring streams join and carry their combined loads to the master stream. Very little if any of the material loosened by the moving waters would lodge on the hill slopes, the grade would be so steep that all the loose débris would be swept along. Likewise little deposition would occur in the minor tributaries issuing from the uplands; their streams would be too vigorous to allow it. The load would pass on to a lower level of gentler slope. This immense load of débris contributed by thousands of minor tributary streams would thus lodge in the main valleys. Some of it would move on down along the main valleys towards and into the sea, but on account of the relatively lower angle of slope the velocity of the streams would not be sufficient to remove

it all; and if part was removed more would constantly be supplied by the tributaries. Hence it is that the larger valleys and some of their tributaries become laden with stratified drift, while the hill slopes are bare or till clad.

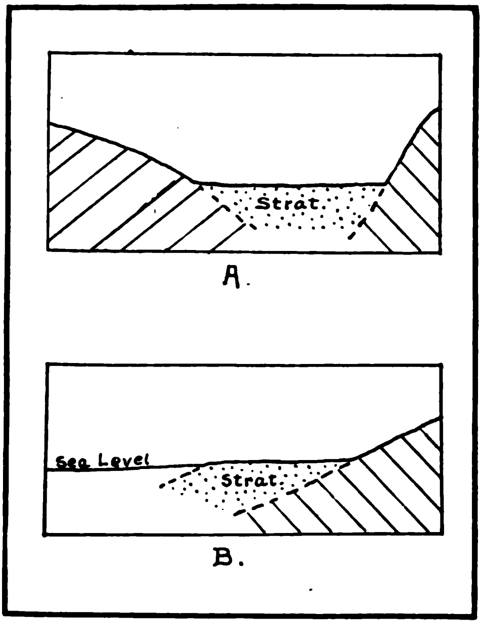


FIG. 5. *A*, Cross section of typical valley filling. *B*, Cross section of stratified drift deposit on sea margin. Typical location for swamps and salt marshes.

As stratified drift fills up depressions uniformly and is built up to a uniform height across the valley by the stream working from side to side, distributing the materials, and spreading them out, its deposits are flat and have a low topographical relief, unless modified by later action. These valley fillings meet the abrupt valley walls at a well-defined horizon (see fig. 5, *A*, and Pl. III, *B*). But where the neighboring slopes of valley or shore are gentle the boundary of stratified drift is not so sharply defined. The low, flat shore margins that have been built up by this filling process are really overlaps (see fig 5, *B*) and represent the formation on which is found so much swamp and salt marsh.

A, Kettle hole. Farm River valley about a mile north of East Haven.

B, Stratified drift.

KETTLE HOLES.

A formation that dots the valley flats is the *kettle hole,* a saucer or bowl-shaped depression without an outlet. Kettle holes are usually 5 to 15 feet deep and 50 to 100 yards in diameter, occasionally 20 to 30 feet deep and 200 to 300 yards in diameter (see Pl. IV, *A*). In the bottom of some kettles are little lakes or swampy spots. The vigorous streams flowing from the glacier carry along with the débris blocks of ice, some of which, at least in the trunk channels, may reach a size to be measured in thousands of cubic yards, or may even approach the size of a small iceberg. The large blocks soon run aground in the valleys and are covered up by sand and gravel. When the receding waters expose the stratified deposits to the air, the covered blocks melt leaving cavities whose sides slump in, making the typical kettle hole.

HIGH-LEVEL SANDS AND GRAVELS.

Some more or less isolated areas of "high-level" gravels and sands occupy positions above the general level of the valleys. Their elevation varies; some are only 100 feet above the valley or plain nearby; others are much higher, one being found 400 feet above sea level and another 500 feet. These deposits were found in the following localities: (north) west of Mount Carmel, northwest of Brooksvale, northwest of Centerville, the highlands of Westville and Maltby Lake, southeast of Wallingford. Some of the stratified deposits of Pine River Valley have this character, and though they are somewhat intermediate in position between the general valley accumulations and the high-level deposits, they belong more properly to the former.

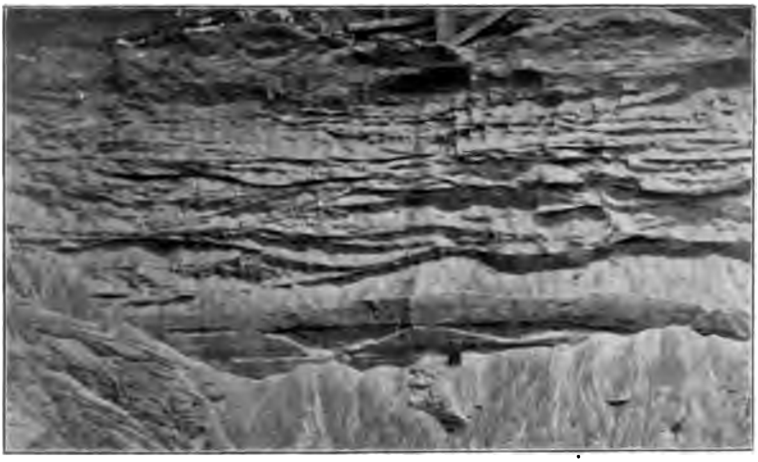
The high-level gravels and sands are best explained by assuming a ponding of the glacier waters by a temporary dam, which held the water long enough for stratified deposits to accumulate at the highest level reached. Either the glacier itself or an especially large accumulation of glacial drift blocked the drainage for a time, or floating ice clogged a channel and formed an ice "gorge." Temporary outlets at levels higher than normal would receive deposits along their courses, or local deltas would build out into this

temporary lake. Kames accumulating directly beyond the ice front might be formed at a higher level than that of the normal drainage lines. Rounded, sharp-sided hills of sand and gravel rising above the general level of the sand-floored valleys northwest of Brooksvale, about a mile northwest of Centerville, and near West Cheshire were probably formed by vigorous waters flowing from the western uplands down through the near-by gaps.

Temporary local dams would account for the other high-level stratified drift northwest of Centerville; for the sandy flat southeast of Wallingford, and for similar formations about a mile and a half south of Mount Sandford, east of Montowese, and in parts of the region south of " Hemingway Mountain " in " Fair Haven, East."

The main dams would occur at two places — one in the notch at the west end of Mount Carmel, and the other at the south end of West Rock Ridge. The Mount Carmel dam was probably an ice gorge with the glacier front not far to the north. The temporary lake formed must have been well covered with floating ice which as it melted dropped large quantities of till-like material upon the stratified deposits. Much of the material deposited in this lake must have been stripped off when the dam gave way, and the lake waters, released, rushed through the notch. The coarse bowlder deposits of stratified drift just south of the notch indicate the strength of the currents at this place.

In the region covered by a temporary lake near the West Rock dam, high-level gravels and sands and a similar layer of till-like material in places overlie stratified drift. As a result of the dam, the excess waters for the time passed out through the uplands of Westville, through the Marvelwood vicinity, south through the Maltby Lakes region, and down through what are now the flats west of Allingtown; below this point the waters diverged, part flowing southeast (where Cove River now is), part continuing southwest. As no deposits except coarse material accumulated wherever the channel was narrow and steep, such old channels are marked either by bare ledge or an abundance of bowlders. In some places along this course the stratified drift deposits are overlain by the till-like material dropped by floating ice, as already described.



A, Stratified drift, showing flow and plunge structure. Upper gravels, unconformity, lower sands. At site of Hotel Taft, New Haven, Conn. (Common brick in middle foreground gives scale.)

B, Thrust fault in stratified drift.

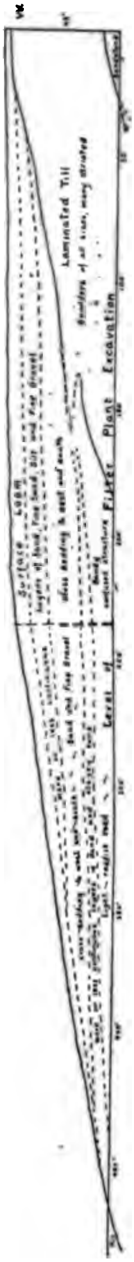


Fig. 6. Sketch section. South face of excavation at site of water filter plant south of Mill Rock, New Haven, Conn. (Vertical and horizontal scales the same.)

SUBGLACIAL DEPOSITION.

It is generally believed that waters moving beneath the glacier and ultimately issuing as subglacial streams will assort and deposit a certain amount of sand and gravel under parts of the glacier itself. Though these deposits are very likely to be obliterated by movements of the glacier at any time, under favorable circumstances they may be preserved. Their position is largely determined by the character of the undersurface of the glacier; the contour of the land or its drainage lines would exert a minimum of control. It is impossible to say to what extent this type of origin may explain the position of some of the high-level stratified drift.

STRUCTURE.

Stratified drift is definitely arranged in more or less regular beds or strata that range in thickness from a fraction of an inch to 3 feet, less commonly 4 to 8 feet, and range in extent from a few yards to a few hundred yards. Some of the layers are sharply separated from those above and below, others grade into adjacent layers; some are intricately cross-bedded, others are even-bedded, still others possess both features. Usually the deposits are horizontal or nearly so, but in a few instances have a decided dip (see Pls. IV, *B*, and V, *A*, fig. 6).

At twelve or fifteen localities the strata are warped, folded, and faulted. Some of the folds are low and gentle, 1 to 5 feet across and 2 inches to 1 foot high; others

are 10 to 15 yards across and 3 feet high; in one place an anticline and two synclines extended 75 yards with no greater height than 3 feet; in some places the fine layers are shortened by crumpling to one-half their original length. The folds may pass into undisturbed strata within a few yards. The faults are all reverse and usually have an overthrust of one-half an inch to 5 inches, in some cases 8 inches to 1 foot; one thrust is at least 25 feet and probably twice that amount. Some of the structures as above described are illustrated by figs. 7-11 and Pl. V, *B*.

As some of the gentle, broad bendings of the layers, particularly those seen in the clay beds, are near the railroad tracks, they may have been caused by the weight of the road bed and the jar resulting from traffic. Other more intricate deformations in the drift, especially those far from the railroad, are due to other causes.

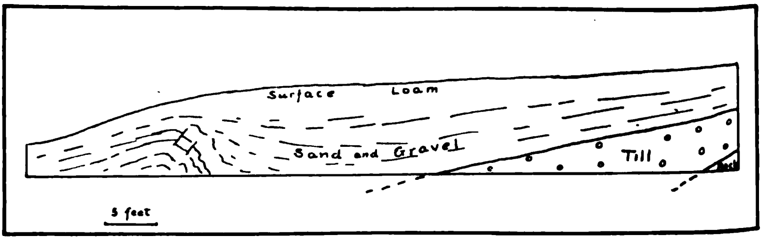


FIG. 7. Cross section showing deformations of stratified drift — faults and anticline.

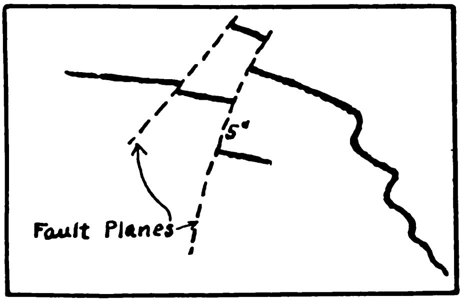


FIG. 8. Detail of section shown in Fig. 7.

The disturbed strata are of too small extent to be explained by shiftings of the earth's crust. They are believed to result from the action of ice exerted in one of the following ways: (a) glacial ice, (b) ice as icebergs, (c) ice as a continuous cover on water. (d) Another force may be gravity.

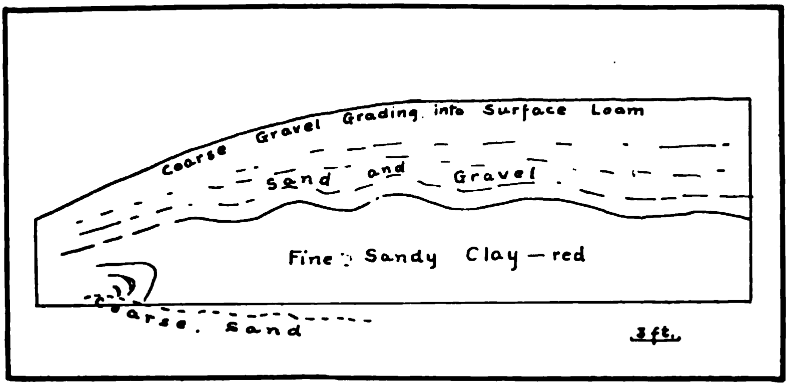


FIG. 9. Cross section showing deformations of stratified drift.

(a) After the accumulation of stratified drift the glacier may have overridden all of the deposits without removing much and without disturbing all of it, providing the glacier was not in the prime of its activity but had the feebleness of waning old age. In some regions one till layer rests upon another older one, and yet

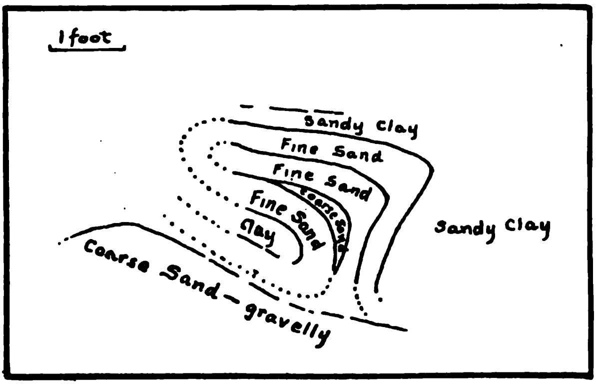


FIG. 10. Detail of section shown in Fig. 9.

the dark layer of soil capping the older till had not been removed by the glacier that brought the second load of till. Such instances make clear that a re-advance of the glacier need not disturb all the deposits it covers. But locally the ice may dig into the deposits and by its power of pushing, bend, crumple, or fault them. Some of the disturbances may have been due to the overriding of the glacier. The thrust fault shown in Plate V, *B*, involves clay in the lower portion. If the glacier had overridden the clay deposit, till must have been deposited upon it, and if till did completely or even partially cover the deposit at one time it is ex-

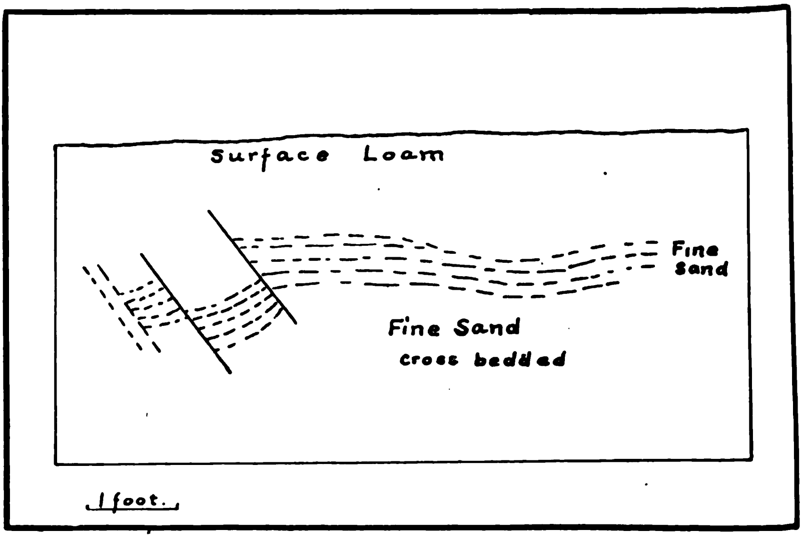


FIG. 11. Cross section showing faults in stratified drift.

tremely unlikely that all was subsequently removed by erosion. But as no till has yet been found overlying the clay, its absence must mean that the glacier never overrode the deposit in question. Besides, some of the planes of deformation both in the clay and elsewhere seem to bear little relation to possible direction of glacier movement and hence require a different explanation.

(b) Floating ice, either as massive bergs or wide stretches of floe ice, when it runs aground, might easily scrape or buckle up the top layers of a deposit, as has already been suggested. Such

a method would apply particularly well to those local disturbances whose plane of deformation bears no relation to the direction of glacier movement: the direction of movement of floating ice may be quite variable depending as it does upon shifting currents and winds. This would be true of any place where water had been ponded. In the Quinnipiac basin, for instance, large masses of ice could exist, might gain sufficient headway, under force of strong wind, to deform and buckle up the clay deposits on running aground.

(c) There is a third way that ice may disturb surface deposits, namely, by ice-thrust. This will be possible only where the overlying water receives a complete cover of ice. This ice cover under changes of temperature may expand and exert a powerful pressure along the shore. Instances of this kind are known where such ice shove has pushed, bent, and piled up the shore deposits several feet in depth, even uprooting large trees.

(d) Gravity.— Many substances tend to move slowly down slopes by the pull of gravity; this is often spoken of as "creep." Under special conditions large masses may move considerable distances and are known as "landslides." Any such movements must necessarily disturb that particular group of strata and also others with which they come in contact. No real landslides have occurred in this region but the principle involved has worked to a lesser degree. This sort of movement, resulting in bending and crumpling of the layers is confined particularly to the clay deposit of the Quinnipiac. Favorable conditions for this deformation exist where erosion has cut a more or less steep bank in the deposit. Some one of the clay layers especially wet and slippery acts as a gliding plane and the mass above moves along it. The size of the mass involved, the rate of movement, and the time determine the amount of crumpling or folding.

In summary it may be said that it is not likely that all of the disturbances seen in the area were produced by any one of the above methods; indeed the discrepancy between planes of deformation and glacier movement exclude that agent in several cases; the position of disturbed strata at a level which well may have been near a shore line suggests strongly the third method — ice-thrust: and disturbed strata occurring in regions known to

have been deeply ponded, etc., point to berg action, etc. Each case must be decided on its merits and but one thing need be emphasized, namely, none of the disturbances actually demand an overriding by the ice.

TEXTURE.

The fragments in stratified drift are uniformly rounded; they are true "water-worn" materials. Pebbles in the gravels are well rounded, some of them being almost spherical. This is true of the small pieces down to a certain size; but the finest sand grains are not rounded; and the very large cobbles and bowlders have only their sharp edges smoothed off. The degree of rounding depends on the resistance of the material, the distance traveled, and to some extent on the original shape of the fragment. It has been found that any grain having a diameter of 0.1 millimeter or less can be reduced no smaller in transportation by water. Sorby has shown that such small fragments are surrounded by a protective cushion of water which is not ruptured by their impact against other fragments, hence their bulk is not reduced nor their shape modified.

The sizes of the fragments may be described by the loosely used terms: sand, gravel, clay. These terms are so indefinitely applied that the writer has undertaken to give them exact definition by using a set of screens as follows:

1m=Screen having 1 mesh to the inch
2m=Screen having 2 meshes to the inch
4m, 8m, 16m, similarly.

The smallest, 16m, is the size of mesh in the ordinary window screen.

The portions separated by the use of these screens were compared by weight and in this way a series of quantitative, mechanical analyses were made. Above 1m, individual pieces are described according to the length of their diameters in inches. Any part of the stratified drift is of course a mixture of variously sized fragments, but the mixing is according to a definite (within limits) percentage of each of the sizes. Five different types were recognized: sand, gravel, coarse gravel, cobbles, bowlders; a sixth

type, clay, requires special treatment. There are all gradations between the types, but the intervals chosen between each are wide enough to be distinctive.

Sand includes ordinary sands as the term is popularly applied, such as are used for masonry work; analyses from four samples of clean building sand follow:

	1.	2.	3.	4.	Average.
2m-4m	0.9%	2.3%	0.6%	0.8%	1.1%
4m-8m	0.7	2.7	1.6	1.6	1.6
8m-16m	1.1	10.0	5.5	6.3	5.7
Less than 16m	97.3	85.0	92.0	91.3	91.5

The great bulk, at least 85 per cent., is less than 16m. Occasionally a pebble may be found which is greater than 2m, but none greater than 1m.

Gravel contains a certain amount of sand and also larger fragments, as is shown by the following analyses:

	1.	2.	Average.
Greater than 1m	0.0%	0.0%	0.5%
1m-2m	12.0	8.0	10.0
2m-4m	16.0	16.0	16.0
4m-8m	12.0	13.0	12.5
Less than 8m	60.0	63.0	61.5

It is seen that about 25 per cent. of gravel grains is greater than 4m. Though not shown in the analyses, in some exposures there are occasional pebbles larger than 1m, the maximum size being 3 inches.

Coarse gravel has increased amount of the large-sized materials. Analyses of material from five typical localities are as follows:

	1.	2.	3.	4.	5.	Av rage
Greater than 1m	46.0%	36.0%	27.0%	21.3%	39.1%	33.9%
1m-2m	21.0	21.0	20.0	19.2	19.1	20.0
2m-4m	14.0	12.0	13.0	12.2	10.1	12.2
4m-8m	7.0	5.0	11.0	9.0	6.1	7.6
Less than 8m	12.0	26.0	29.0	38.3	25.6	26.2

The pebbles greater than 1m have a maximum diameter of 7 inches, most of them being 2 to 4 inches. At least 50 per cent. is greater

than 4m and 20 per cent. greater than 1m. The intermediate sizes, particularly less than 1m and greater than 2m, are quite constant, the variation appearing in the extremes of the series; this hardly seems to be a coincidence.

Cobbles may be described as a type of stratified drift having pebbles 7 to 12 inches in diameter set in a matrix of coarse gravel or, less commonly, of gravel or sand.

Bowlders make up the type of drift having individual fragments which are greater than 12 inches in diameter; the matrix usually has the texture of cobbles or coarse gravel (see Pl. VI, *B*).

Places are known where 95 per cent. of an exposure is sand but where there is an occasional cobble or bowlder, probably brought in by floating ice.

The types indicated by the analyses may be tabulated as follows:

Types	Greater than 1m	1m-2m	2m-4m	4m-8m	8m-16m	Less than 16m
Coarse Gravel	20-50% Max. 7in.	25-35% 20+%		5-15%	No more than 40%	
Gravel	1+% Max. 3in.	20-30%	15-?%	10-20%	No less than 40% 15-30%	
Sand	0%	1+%	1-5%		No less than 90% 1—10% Commonly 85-95%	

The types described are offered as standards until the gathering of more extensive data demands a revision.

As any one exposure may not be a pure type, each exposure of the drift should be classified according to its predominant type. On the other hand there may be so much variety in a single exposure that each bed or group of beds should be described separately. Both methods have been used by the writer.

The purpose of analysing the deposits will be appreciated when it is realized that the size of a fragment is a measure of the strength of the stream that carries it. The position of glacial streams can thus be determined by the position and texture of the deposits they left behind.

A, Upper gravels resting unconformably upon lower sands.

B, Bowlders resting on sandstone at outlet of Lake Dawson.

Clay, the sixth type of stratified drift, consists of very fine grains all of which will pass easily through the 16m screen. Though in general different, because of its stickiness, plasticity, etc., from the other types, clay is also a mixture of variously sized particles.

Pure clay has already been definitely described as to the size of its component grains,[1] which are extremely small (0.005 to 0.0 millimeter); but ordinary clay, such as is used in the arts, contains coarser though not large grains. A common brick clay of good quality has, besides its pure clay content, a large proportion of grains the size of silt (0.05 to 0.005 millimeter), a certain amount of finer sand (0.25 to 0.05 millimeter), and may also have a small proportion of larger sand grains (1 to 0.25 millimeters). In the sand and gravel types above described is always a very small per cent. of true clay, and here and there are small lenses and pockets of fine sand containing an appreciable amount of clay, all of which could well be included in the type sand, if there were not large deposits of commercially valuable clay which require special consideration (see p. 52).

Exclusive of clay deposits, stratified drift has a loose, open texture, and cementing substances are commonly lacking. On account of this quality, excavation is easy, but the material readily caves in. Any considerable cut in stratified drift can hardly get well under way without several thousand dollars worth of timber and planks.

COMPOSITION.

The variety of rock fragments present in stratified drift depends on its texture. In the coarser grades — gravel, coarse gravel, and bowlders — there are just as many different kinds of rocks as in till, from which they have been derived. The coarse materials have not been transported far enough to lose their character. This is true to a lesser degree of the coarse sands. The sands, particularly the finer grades, show much less variety and may have scarcely any rock fragments. They are composed chiefly of mineral fragments — quartz, feldspar, varying small

[1] Soil Survey Field Book: U. S. Dept. Agr., Bur. Soils, pp. 17 and 18, 1906.

amounts of magnetite, garnet, muscovite flakes, and rarely other minerals; the rock fragments when present are commonly fine-grained sandstone. The abrasion and disintegration caused by transportation may have reduced the rock to mineral fragments, but as the materials were not carried great distances it is more reasonable to assume that most of the change from rock to mineral took place before transportation by water.

COLOR.

Like till stratified drift has two colors — yellow-brown and reddish brown. The former is the more common, particularly at the surface; but red-brown is not uncommon, particularly where excavation has exposed the lower strata. In some places the fine sands are bright red, in others they are pale red. If yellow and red are present in section the yellow is always above. On appearing at the surface each color is modified by admixture of organic matter which darkens the tone.

In some places a color, pale yellow to nearly white, has resulted from bleaching caused by solutions from overlying organic matter. The sand layer immediately beneath the peat deposit in the Quinnipiac Valley is an example.

The red color is due in part to small grains of red shale or sandstone, in part to pink feldspar grains and garnets, and in part to quartz grains coated with a thin film of hematite. The yellow color is due partly to the lack of red fragments of minerals or rocks, more commonly to the change of the film of hematite on quartz grains to limonite by weathering.

THICKNESS.

In some places, usually on the margins of the deposits, stratified drift is only 2 to 3 feet thick, and many wells obtain water in stratified drift at depths of 12 to 40 feet. In one place a thickness of 276 feet is known, in a number of places a thickness of over 100 feet, and in still more a thickness of 50 to 100 feet. At one place a boring 76 feet deep struck no rock, and at another a 90-foot well passed through sand and gravel without meeting a ledge.

UPPER GRAVELS.

Differences in color, texture, and structure make it advisable to classify stratified drift as upper gravels, lower sands, and clay.

Upper gravels, so named because of their position and texture, occupy the upper portion of stratified drift and have a thickness of 8 to 25 feet. Sands are found in it, but gravel, coarse gravel, cobbles, and bowlders predominate. The upper foot or so is in many places sandy, even where the bulk of the formation is coarse gravel. Elsewhere the coarse grades persist to the top. The only considerable variation in texture noted is the clay deposit in Hamden, southwest of Cherry Hill, which grades out into coarse material.

The structure shows considerable variety. Cross-bedding is common, and the flow and plunge structure (see Pl. V, *A*) is found in several places. Layers are short and lenslike and change rapidly in character vertically and horizontally (see Pl. VI, *A*). But where made of coarse gravel or bowlders, the layers may be thick and massive for perhaps 100 yards in length (see Pl. VI, *B*). The color of the upper gravels is yellow-brown. They lie upon the eroded edges of the lower sands.

LOWER SANDS.

The lower sands formation lies directly beneath the upper gravels. It consists of sands of various grades — coarse sands, ordinary building sand, fine sand which is often spoken of as quicksand, and some claylike material but no clay deposits either of commercial quality or extent. Locally gravel layers may be found in the lower portions.

The lower sands are characteristically even-bedded, cross-bedding is lacking or on a small scale; the layers are of greater extent; not prominently lenslike, and vary slightly. The color is red-brown ranging from a distinctly bright color to the more common quieter tones.

The division between the upper gravels and lower sands is a plane of unconformity wherever observed. In the New Haven plain it was seen along the whole "cut" where the Shore Line enters the city, also in more than 20 other scattered localities.

At five places each in the Farm and Mill River valleys and at ten different places in the Quinnipiac Valley the same condition exists. The exposures are sufficient in number and widely enough separated to indicate that the unconformity is a regional feature. The upper gravels rest directly upon the eroded surface of the lower sands. There is no intervening soil layer. An undetermined amount of the lower formation was removed by the waters that brought in the upper (see Pl. VI, *A*).

Since they possess such different qualities, it is obvious that the two deposits must have accumulated under unlike conditions. The character of the upper gravels points to vigorous, shifting currents with abundant supply of materials, and that of the lower sands to moderate or slight currents with moderate but steady supply of material. In quantity the lower sands greatly exceed the upper gravels. The difference in color also leads to the conclusion that the materials were gathered under different conditions. The yellow-brown of the upper formation could not have been produced by weathering after the deposit was formed, for the color is uniform from top to bottom and stops abruptly at the line of contact below.

Since stratified drift has been derived from till it follows that directly after the deposition of the till and the withdrawal of the ice, erosion working upon the till gathered material which was carried away and accumulated as the lower sands. These are red because the till from which they were derived was red due to the great quantity of local rock débris present. Wherever the lower sands are near the crystallines, that is, nearly off the sandstone area, the red color is not so pronounced — as should be expected under this theory. The vigor of this erosion and accumulation diminished or perhaps stopped and a certain amount of time elapsed; the length of this time interval can not be definitely stated, but it was long enough so that during it the till weathered probably to considerable depth; the weathering of course changed the color of the till from red-brown to yellow-brown, similarly as we find it today.

Then a new cycle of erosion and transportation ensued. The yellow-brown till was removed, carried, deposited, and became the upper gravel. The initiation of this cycle and the increased

strength of the currents during this second period might have been due either to climatic change inducing a period of heavy rains, or more likely to increased rate of melting of the near-by glacier ice. This second period was not as long as the first, for the thickness of the formation is very much less. That we do not find a second red-brown deposit in the upper part of the upper gravels shows that erosion had not continued long enough to cut through the weathered part of the till and attack again the unchanged redder portion. Contemporaneous cutting of the upper part of the lower sands would produce an eroded surface for the upper gravels to rest upon.

DIRECTION OF CURRENTS.

The directions which the main currents took in transporting stratified drift can be determined by noting the texture of the deposits. A line of coarse gravel flanked on either hand by lines of gravel or sand means a stream with a central swifter portion, and a change in texture from place to place indicates a corresponding change in the strength of the currents. Many pits, cellar holes, cuts, and excavations for water or sewer pipes have been examined with the view of gathering sufficient data to reconstruct the lines of drainage (see Pl. I and fig. 15). Attention has been necessarily confined to the upper gravels.

In Plate I the varying textures of drift are plotted, determining the general course of the currents that brought in and deposited the upper part of the stratified drift (upper gravels). In figure 15, a portion of the area is marked with the current directions. The most striking feature in this connection is the close relation between the glacial currents and the present drainage. The waters collected from many points in the uplands and concentrated along the four main valleys in much the same way as today, but the glacial streams were larger and more active. All the types of stratified drift (p. 40) are represented, even to bowlders. Coarse gravel is very common. The ancient West, Mill, and Farm rivers had the swiftest currents. Mill River, for example, has coarse material thoughout its extent, the deposits being progressively, but slowly, less coarse from north to south,

except where the channel narrows at Mount Carmel and between East and Mill rocks. Probably the bowlders in Fair Haven have been floated in by ice.

The Quinnipiac Valley, in contrast to the other three valleys, has very little coarse material. The texture, with the exception of some coarse gravel near Yalesville and between Montowese and North Haven, is sand or gravel. The first locality is near the head waters of the stream, a natural location for coarse deposits, which give way to finer materials because of the lessening grade of the stream and the widening of the valley. The second locality is near the mouth of Five Mile Brook and represents that stream's contribution to the general valley filling. Augmented by Pine River it built out a wide delta into the Quinnipiac Valley. Not only the coarseness of material at this place but also the dip (north and west) and strike of the planes of cross-bedding show that the tributary was the cause. In other places where the sand of the Quinnipiac coarsens or changes to gravel the change is due to some small tributary, as, for example, near Mount Carmel.

The New Haven plain has been built up by a coalescence of deposits brought by Mill and West rivers plus certain amounts representing the drainage from the Cherry Hill-Lake Wintergreen region. The conditions were those operating on subaerial deltas, where the streams shift from side to side, cutting and filling, working over the deposit, and spreading it rather evenly. Small erosional channels are occasionally seen in the deposit. This method of work must have been followed by the streams throughout their courses. As a result, long stretches of coarse gravel would be formed, grading upstream into cobbles and downstream into gravels and sands, and varying locally on each side of the main currents throughout the whole valley.

The dip and strike of cross-bedding fit in with direction of currents as plotted by varying texture.

The currents that deposited the lower sands followed much the same paths (Pl. I), with at least one important exception. During the early part of the deposition Mill River could not get through East Rock gorge but took its course to the west of Mill Rock and through the Beaver Swamp region. A reference to the

bedrock map in Plate IX will show that the deeper valley had the route indicated. But as the lower sands were built up and the valley was aggraded until it was on a level with the bottom of the gorge, part of the water was able to pass through the East Rock gorge, which later, during the deposition of the upper gravels, was the most direct route.

FLUVIATILE OR ESTUARINE.

The discussion so far has emphasized the fluviatile origin of stratified drift; deltas have been considered as subaerial rather than submarine. The theory of another type of origin, the estuarine, has been suggested. By this it is assumed that the land was depressed sufficiently for the four valleys to be flooded by marine waters, into which the rivers may have dumped their loads; but distribution and deposition of materials were due primarily to the action of currents and tides within the estuary itself. There are several objections to this theory.

(a) If the land were submerged sufficiently to make estuaries in all the valleys the deposit in each valley ought to build up to approximately a uniform height, the upper limit being determined by the depth of water. But the deposits are not at uniform heights. Along parallel 41° 20′ stratified drift reaches a level of 90 feet in West River valley, 70 feet in Mill River, 50 feet in Quinnipiac River, and 110 feet in Farm River. In the latitude of Lake Dawson, West River deposits have an elevation of 170 feet; Mill River, 100 feet; Quinnipiac River, 70 feet; Farm River, 170 feet; and on an east and west line about one mile north of New Haven, deposits reach a level of 100 feet in Mill River, 80 feet in Quinnipiac River, and 200 feet in the Farm River. These figures show a great difference in the heights above sea level of the deposits in the various valleys. Though it is possible that movements took place after the deposition of stratified drift, causing a difference in the heights of the valleys, it is not probable that so much action could take place in so restricted an area without leaving other traces; a movement affecting a valley as a unit very likely would affect parts of all the valleys. It might be urged that the filling of the estuary is determined by the amount of sedi-

ment brought in and the depth of the water. This is true and might possibly account for the great difference of level, and if this were the only objection it might be ignored. If the currents in the estuary were as vigorous as is implied by the size of the material, they could easily have carried away and deposited all the load of stratified drift as fast as it was supplied by the rivers and such differences of elevation would not be necessary.

(b) The second objection is based on the texture of stratified drift. Coarse gravel and cobbles are found spread along the valleys for several miles, in the case of the Mill River valley throughout its extent, a distance of fourteen miles. It is not conceivable that the waters of any estuary could transport such coarse material so far. The water of an estuary is rather quiet except in narrow estuaries having high tidal action — as in the Bay of Fundy — in which cases the greatest activity of the currents is at the outlet and results in much scour and erosion. In the New Haven region there were (if we assume an estuarine origin) four narrow estuaries. But their outlets are places of deposition rather than erosion. There is no reason why the tidal action should have been more vigorous in the Mill than in the Farm estuary, nor should the tidal currents have been the cause of the quantity of coarse material in the New Haven plain and the lack of it in the East Haven plain. Currents caused by tidal action could not have produced the variety of texture found in regions of similar topographical position, and currents initiated by large streams entering at their heads could not have been maintained for any long distances. The only possible way that estuaries could have coarse materials throughout their extent is in the case of rather narrow estuaries with a great number of marginal tributaries flowing into them, each tributary being active and carrying a good load. If these tributaries were all of equal strength, all carrying the same loads or nearly so, and all were close enough together so that their deltas coalesced and made a continuous deposit, then the floor of an estuary would be built up by a deposit that simulates the deposit found in the region under discussion. But such a complete combination of conditions would be entirely fortuitous and extremely unlikely. That such conditions did not operate in Connecticut is seen when, for ex-

ample, the deposit on each side of East Rock is considered. As the drainage from the cliff on the west side of the rock would have been practically nil, assuming a marginal drainage filling, practically all the Mill River deposit must have come from the east slope of Prospect Hill. The east slope of East Rock would be an equivalent to this and though the deposits in the Quinnipiac Valley are sand, in Mill River valley they are coarse gravel and cobbles.

(c) Absence of any shore phenomena is another objection to the estuarine theory. A body of water should make a record of itself along its point of contact with the land. Beaches and other evidences of wave work are, however, not found on the New Haven plain. They may have been obliterated by subsequent erosion, but it is unlikely that all traces would have been removed.

(d) A final objection is the lack of fossils in stratified drift. Only one fossil has ever been known — two bones of a land animal, reindeer, found in the clays of the Quinnipiac.[1] If marine waters were present when the deposits were laid down some record of the marine life would have been made, and even if not abundant it would have come to light somewhere in the numerous excavations for cellars, wells, sewers, water mains, trolley cuts, etc. The writer has studied over 150 different exposures and has information concerning as many more, but no fossils have been found. If they were ever there surely diagenetic changes could not so have obliterated all traces of them! The coldness of the glacier waters did not necessarily prevent life in them, for arctic waters possess life. Other regions along the coast where the glacier deposits are known to have been marine have fossils.[2]

The assumption that submergence was confined to the lower portions of the valleys with streams in the upper portions is not satisfactory. For instance, assume a submergence to the present 100-foot contour: this would mean a flooding of the whole Quinnipiac Valley, Mill Valley above Mount Carmel, Farm Valley above Totoket, and West Valley nearly to Lake Dawson; and yet

[1] Dana, J. D., On southern New England during the melting of the great glacier: Amer. Jour. Sci., 3d ser., vol. 10, p. 353, 1875.

[2] Stone, G. H., The glacial gravels of Maine and their associated deposits: U. S. Geol. Survey Mon. 34, pp. 41 and 54, 1899.

we find no contrast in texture at these points that would suggest a difference in current velocity, no shore phenomena, and no evidence to show a change of conditions at or near that level. The same objections hold if submergence to other levels is assumed.

CLAY.[1]

Clay is found in commercial quantities at two localities: south (west) of Cherry Hill, Hamden, and in the Quinnipiac Valley. The Hamden clay, which occupies about half a square mile, is inferior in quality to the Quinnipiac clay and has not been worked for fifteen years. The Quinnipiac clay is of much importance because of its excellent quality and large extent; it underlies the whole valley. It is mined in a number of pits between New Haven and North Haven and also at Montowese. It appears at the surface in Worton Brook, in the Quinnipiac River at the east end of Mount Carmel, and at another point just below this. It occurs in a deep well at Wallingford. Undoubtedly it is a continuous deposit from the north edge of New Haven up the valley to Wallingford and probably to Yalesville.

Clay does not appear at the surface in many places, except as the cover has been stripped away by man. It is overlain by sand and gravel, which in turn in a large part of the valley is overlain by swamp muck and peat. The depth of this cover ranges from zero to 70 feet.

In the southern part of the valley, at the Davis clay pit, the cover on the west side consists of 5 to 8 feet of sand and gravel with no peat above; on the east side the gravelly sand thins to from 1½ to 2 feet and the peat is correspondingly thicker, 4 to 6 feet; and borings show that the cover thickens rather rapidly southeasterly. At the Stiles pit, about one mile south of North Haven there is little peat, and the gravel and sand increase to from 4 to 12 feet. At the margin of the valley west of this pit the depth of the cover is 70 feet. Between North Haven and Wallingford, peat is absent; clay appears at the surface in three places (see above); and in the city of Wallingford from 30 to 35

[1] The general features of this clay and its economic development have already been treated by G. F. Loughlin in Clays and Clay Industries of Connecticut: Connecticut Geol. and Nat. Hist. Survey Bull. 4, 1905.

feet of sand cover it. In Montowese the sandy cover ranges from 2 to 15 feet.

Evidence shows that the surface of the clay is undulating rather than flat and that it has several channels running through it.

Sand and gravel, which are usually coarsest at the bottom, overlie the clay, meeting is abruptly; the contact is extremely sharp. With the exception of the Hamden deposit, where clay rests upon sand and gravel, clay rests upon rock. The Quinnipiac Valley deposit has been penetrated in four places, and in each of these rock was found immediately below clay. Clay deposits in other parts of the State are reported to rest on till.

Except for peat and swamp the cover is usually sand or sand and gravel, rarely coarse gravel. Some buried tree stumps still upright and portions of tree trunks or logs, the largest one with a diameter of 18 inches, are found in peat. Nowhere in the entire Quinnipiac deposit has till been found overlying clay. The glacier did not, therefore, pass over the deposit, for it is hardly probable that till was deposited and entirely removed later.

The depth of clay is accurately known in only a few places. In the Stiles pit at North Haven a well penetrates 60 feet of clay before striking rock; at Wallingford a well record shows 150 feet of clay; and in two places at the margin of the deposit clay was only 4 feet thick and poor in quality. In workable pits clay has been dug out or explored to a depth of 20 to 40 feet without reaching bottom. With these figures an estimate can be made of the quantity of clay in the valley. If we consider the average depth as 36 feet, which is surely a moderate estimate, the average width as half a mile, and the length as 10 miles, there would be 185,856,000 cubic yards of clay. If the entire amount of clay taken from the Davis pit (which has been operated for 35 years) should be removed each year, there would be enough for more than 1,500 years.

Clay is very uniform throughout the Quinnipiac Valley. It shows with great persistence a regularity of bedding which has given rise to the term "layer clay." Two substances make up the beds, clay proper and silt. These alternate systematically, under average conditions the clay repeating itself fifteen times in each

vertical foot (see Pl. VII). The Hamden clay was not exposed for inspection, but from evidence furnished by those who saw the pits when in operation it lacks the layer arrangement. The clay deposit is uniformly red.

The clay proper is very pure in quality. It is of so fine a texture that no grit can be felt by the teeth and when stirred up in water it will long remain suspended. Because it is extremely unctious and slippery when wet it is locally spoken of as the "grease" layer. These layers are a quarter to half an inch thick.

Silt is also of a fine texture. It has some true clay in it, but it consists essentially of silt and a certain amount of very fine sand. It feels gritty to the teeth and has the appearance and quality of fine quicksand. At the bottom of each layer there is likely to be a thin lamina of small scattered grains of sand. The thickness of silt varies more than clay; ordinarily it is half an inch to 1½ inches thick, in a few instances attaining a thickness of 4½ inches and rarely even several feet. These layers may show a subdivision into very thin laminae, about fifteen to half an inch. The contact of the lower part of the silt and the upper part of the clay layers is uniformly regular, distinct, and abrupt; but the lower part of the clay layers grades into the upper part of the silt.

Concretions are commonly found in the silt layers. They have a great variety of shapes — disklike, globular, finger-like, and many imitative forms — but all are rounded and many are very symmetrical. They are composed of clay and silt plus (50 per cent. more or less) lime carbonate. Unlike many concretions those from the Quinnipiac Valley do not show a nucleus nor concentric banding or onion-like structure, but they do include occasional grains of the mineral, calcite. It seems most reasonable to believe that these concretions were formed subsequent to the accumulation of the silt layers, which contain a certain amount of lime carbonate even where there are no concretions. It is believed that water percolating through the silt layers gathered the scattered lime carbonate; later, under favorable conditions, this was deposited at certain spots in with the silt and clay. The exact mechanism of deposition and its immediate cause, however, are not clearly understood. The clay layers have no concretions, nor do they contain lime carbonate.

Clay also contains large amounts of the same mineral grains as coarse drift but in a very fine state of division. There is in addition an appreciable quantity of kaolin and other hydrous decomposition products.

The most extensive use of clay is for brick, and it is used to a smaller extent for flower pots and tiling. Because of the regularity of the layers and the proper proportion of silt and clay present, as a whole it requires a minimum of preparation before using[1].

The great regularity and thickness of the deposit suggest uniform conditions existing over a considerable length of time. Since the material is so well stratified and so evenly spread it must be concluded that the clay and silt accumulated in some quiet body of water — a lake, not the sea. The bedrock map (Pl. IX) shows that there was a rock basin with at most only a small outlet to the south.

The regular alternation of silt and clay points to regular changes in supply of material; probably a seasonal change. That is, during one season of the year the streams, due to added water, were more active in getting and carrying rock waste — silt and clay. The silt would very soon settle to the bottom; the clay because of its extremely fine grain would settle slowly, and it might take most of the succeeding season for the waters to be cleared of it. Then when the season of supply came around again a new quantity of silt would be deposited directly and abruptly upon the top of the clay layer, and the process of rather rapidly accumulating silt accompanied by a constantly slow accumulation of clay would begin anew and be followed by a steady but slow accumulation of clay alone.

The cause of the streams' regularity was probably a meteorological or climatic one. The supply streams in the season of accumulation are more active because their volume of water is increased. This increase may be due to rainfall, in which case the regularity must be considered. Under conditions as we know them today our rainy times of the year are spring and fall; under

[1] For a more complete account of clays in general, their qualities and uses and the status of the clay industry in Connecticut the reader is referred to G. F. Loughlin's Clays and Clay Industries of Connecticut: Connecticut Geol. and Nat. Hist. Survey Bull. 4, 1905.

this count of two, each two clay layers indicate a year in time. There are on the average 15 clay layers to the vertical foot; if the average depth of the clay deposit is considered to be 50 feet there would be 750 clay layers, which on the above assumption of two a year makes 375 years for the accumulation. If a rainy and dry season are considered as operating at that time we would need to conclude that each clay layer represented a year, making the total time 750 years, and if the average depth taken is 75 feet the time would be proportionately longer. On the other hand, if we try to shorten the time by assuming other rainy periods than spring and fall we are confronted by the regularity of the deposit: our monthly or weekly rains hardly come with the regularity indicated by the deposit. A period shorter than a week could not be assumed, for the clay would not have time to settle.

The regularity need not, however, be one of time but of supply. This will be better understood by considering first the action of different-sized particles in water. The rate of subsidence of any particle through a column of quiet water depends on its mass, which in turn is dependent upon its diameter. Specific gravity need not be a disturbing factor, since ordinary sediments are approximately the same in this respect, namely, about 2.6.

Figures given by Hall[1] show that particles fall at the following rates:

(x) Diameter 0.04-0.01 mm. Fall 10 cm. in 100 sec.=12 $\pm$ ft. in 1 hr.=288 ft. a day.

(y) Diameter 0.01-0.002 mm. Fall 7.5 cm. in 12½ min.=15 in. in 1 hr.=30 ft. a day.

(z) Diameter 0.002-0 mm. Fall 8.5 cm. in 24 hrs.=3.4 in. in 24 hrs.

Silt particles as defined by the Bureau of Soils[2] have diameters 0.05 to 0.005 millimeters.This is intermediate between (x) and (y), and an estimate of 100 feet a day would be conservative, and the coarse part of the silt with the fine sand grains would fall that distance in a few hours. Clay particles which have diameters 0.005 to 0 millimeters would be intermediate between (y) and (z), so the coarser clay particles could easily fall a distance of 5 feet in a day, intermediate particles less than a foot a day, and the finest would remain in suspension indefinitely.

[1] Hall, A. D., The Soil, pp. 52 and 53, 1907.

[2] Soil Survey Field Book: U. S. Dept. Agr., pp. 17, 18, 1906.

If the Quinnipiac lake, therefore, had a depth of 75 feet, the bulk of the silt layer, composed of silt proper and some very fine sand, would fall through 75 feet of water in a few hours and all of it in less than a day; the bulk of the clay layer, composed of clay proper and fine silt, would need from 5 to 15 days to settle through a distance of 75 feet, and the remainder would require from one month to five months.

Assume that the Quinnipiac lake received a supply of mixed fine sand, silt, and clay. At the end of 24 hours the silt layer as we know it, containing some fine silt and clay would be deposited, the clay increasing as the top of the silt layer was approached and grading into the clay layer proper in the 5 to 15 days needed for its accumulation on top of the silt layer. After that, clay would continue to fall very slowly and in extremely small quantities. If a second similar supply was received 15 days later the process would be repeated with the second silt layer resting abruptly upon the top of the first clay layer.

Providing the supply was the same every time, the appearance of the layers would be alike whether the interval between the supplies was 20 days or 6 months. The uniform thickness of the many layers shows that the supply was the same, as only locally do they vary. The depth of the water would make some difference in these calculations. The bulk of the clay deposit is more than 40 feet thick, in one instance 150 feet, and a certain amount of water was present above the topmost layer. The depth of the water would be lessened by the constant filling of the lake basin. However, its depth is probably not a critical factor, for a vertical range of 20 feet in the deposit shows no perceptible variation in the thickness of the layers. Consequently, the conclusion drawn is that each layer had sufficient time to accumulate, and that though the time interval between supplies might have been extremely variable, the amount of the supply was regular and uniform.

That each rainfall in turn was of such uniform intensity and character as to cause the erosion and transport of the same amount of material in every case seems unlikely, so another explanation is given:

A glacier is melting at some point all the time, less near its source and more at it lowest extremity. Its melting depends somewhat on pressure but chiefly on the temperature of the surrounding air and the action of the direct rays of the sun. Hence the greatest melting will occur in warm seasons and during the daytime. The amount of water resulting is quite uniform. It has been noted that streams flowing from banks of perpetual snow have a minimum volume in the early morning, that the volume increases as the day advances and reaches a maximum in the afternoon. Day after day as long as the climatic and weather conditions are uniform, the waters rise to the same height and fill the valley to the same level. A similar seasonal regularity is based on the daily supplies. These come from countless different parts of the glacier; merge into one another, one day's melting overlapping the next farther along the line; and eventually the major drainage channels receive a steady supply of water throughout the summer season. The position of the ice front may change and so modify the situation, but its change is slow and due also to climatic conditions. The presence of occasional cobbles and bowlders in clay deposits points to floating ice as a carrier. This does not necessarily imply glacier ice fragments, river ice would serve as well.

Hence, by the seasonal melting of the glacier ice a regular supply of water was liberated; this in turn carried a uniform amount of silt and clay each season. The clay deposit, therefore, must have accumulated while the ice front was rather stationary some distance to the north of the Quinnipiac basin. Its location is not known positively. It could not have been very near, for the waters had already lost the coarser parts of their load; if too near, the diurnal variations in supply would have given a more mixed character to the deposit, while being far enough away the steady seasonal supply, already described, would bring more uniform material. Probably the ice front was not far north of Yalesville.

The time involved in the formation of a silt layer and a clay layer, according to the method above described, would be a year. With the average of 15 layers to the foot and with a depth of 50 feet, 750 years would be required to build up the deposit, which

would be increased to 1,125 years if the average depth is considered 75 feet. The depth of 150 feet noted in one place would indicate 2,250 years. But it is not known absolutely that the same average — 15 layers to the foot — holds true for the entire depth, and in fact some local variation lessening that figure is known. Nor is it certain how much, if any, of the deposit has been removed since its completion. Owing to the incomplete record no definite figure for the time involved can be given, but it is safe to say that the deposit required at least 500 years and no more than 2,500 years for its accumulation.

The clay layers have been disturbed subsequent to their deposition as evidenced by broad bendings and by a warping apart (see Pl. VII). Others are crumpled or broken and faulted (see fig. 12), the faults being of the reverse or thrust variety; the large thrust fault shown in the stratified series, Plate VI, *A*, involves clay in its lower portion. Another type is as follows: a group of layers (*x*, fig. 13), 1 foot to 2 feet wide and about 5 feet below the top of the clay, is intricately crumpled, but both above and below the layers are but slightly disturbed. The assumption in

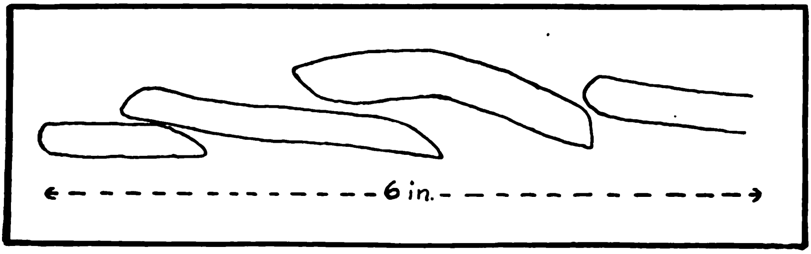


FIG. 12. Cross section showing deformation of clay layers.

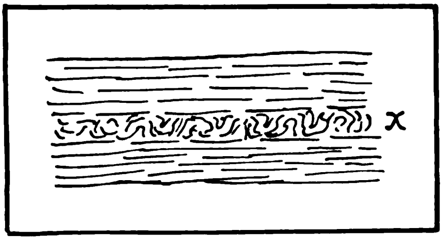


FIG. 13. Cross section showing deformation of clay layers.

this case is that the upper beds were moved bodily, and the group of layers, *x*, acted as a gliding plane. It is believed that the deformation of clay and the other parts of stratified drift has resulted from a common cause or causes.

TERRACES.

Terraces form along river valleys whenever the river after building a flood plain changes its habits and becomes an eroding stream. Those parts of the original flood plain that remain on either side of the valley are the terraces. Terraces may also develop along the margin of a body of standing water by the action of the waves. They may be formed in any type of material: solid rock, silt, sand, or gravel, and they are continually subjected to weathering and erosion which may remove or obliterate them.

In the New Haven region terraces are most common in stratified drift. All the large valleys and many tributary valleys have them to some extent, but only along parts of their course are they well developed, and they may be entirely lacking. Usually there is only one terrace lying 15 to 25 feet above the present flood plain of the streams. In a number of places there are two terraces, the upper one standing 10 to 15 feet above the lower, and the lower one 5 to 15 feet above the flood plain.

Stratified drift is an accumulation that has filled in the valleys (see *A*, fig. 14). If the process of removal starts near the center a terrace is formed on each side of the valley as a *B*, but if it starts from the margins (*m* or *o*), particularly where the drift rests on rock, the underlying ledge acts as a resistant floor from which the waters can easily sweep the looser stratified drift. The process initiated, perhaps, by drainage down the slope into the valley would result in a terrace on one side of the valley only (*C*, fig. 14). The same result might occur where stratified drift rested on till rather than on rock, for the two materials are unlike in texture and the effect of water falling on them would be different. As stratified drift is porous, water will soak into it rather than move along its surface, but the compact till tends to retain the water on its surface. Supposing the terracing process started at the margin *m*, water would soak into stratified drift at that

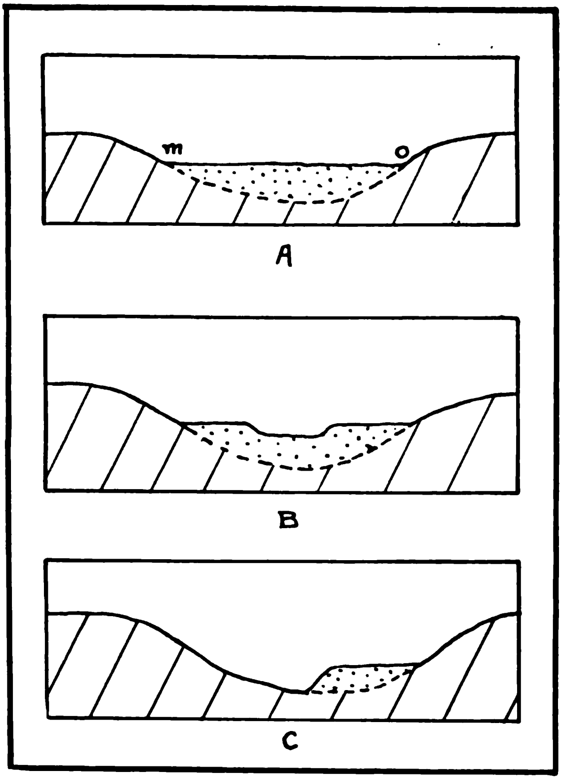


FIG. 14. Cross sections showing formation of terraces in valley fillings of stratified drift.

point, would meet the more impervious till, and move along its upper surface carrying the less coherent stratified drift along; continuation of this process would strip back the stratified drift until the conditions seen at *C* resulted, or all the stratified drift may be removed, leaving no terrace.

Less commonly terraces are found in rock. They are found at a few points along the main valleys and a little more commonly in the tributary streams flowing from the uplands. In some places deposits of drift obscure them. The presence of till over the rock terrace means that the cutting by the streams took place before the deposition of till or stratified drift. At one place a pot hole was found on the terrace.

The energy of a stream is expended both in erosion and transportation, and whether a stream will cut or deposit depends on the balance between velocity and load. A stream will change to the cutting habit when it has either less load to carry or greater volume of water for the same load, or greater slope with the same volume and load than formerly. In the New Haven region the load may have lessened as the glacier receded. The melting ice may have furnished the same amount of water when the glacier was much farther to the north, but the load would most likely be dropped nearer to the ice front. There may have been, therefore, a progressive filling and terracing as the glacier retreated. The increased activity of streams indicated by terracing may also have resulted from an increased volume of water due to a faster melting of the glacier or to increased rainfall in response to a climatic change. Terracing in the glaciated region of the United States has usually been ascribed to a progressive change of level in the land as the glacier withdrew. There are three objections to this theory of elevation as a cause of cutting:

(a) The cutting is uniformly deep throughout the valleys. If elevation alone were the cause, the amount of cutting along the valley from source to mouth would depend upon the position of the original stream with reference to base-level. If at base-level then with a uniform elevation of x feet a trench x feet deep would result. If the elevation were differential — nearer the source — the trench would deepen towards the headquarters of the stream. As a matter of fact, the terraces do not become higher as the upper parts of the stream are approached, nor were the streams at or near base-level when terracing began.

(b) The terraces are so little cut by erosion channels that a rather recent cutting is implied. But the assumed elevation occurred immediately after the withdrawal of the ice, which would mean a longer time since elevation than erosion suggests.

(c) A simpler explanation is possible. It is believed that cutting has resulted upon increased volume of streams due to climatic changes.

The same waters that formed the terraces in the stratified drift did not produce those formed in the rock, for they are overlain by till. These latter were formed at an earlier period. They

may be entirely preglacial. But more likely they were formed as the glacier advanced, the cutting being initiated by the added waters from the oncoming glacier.

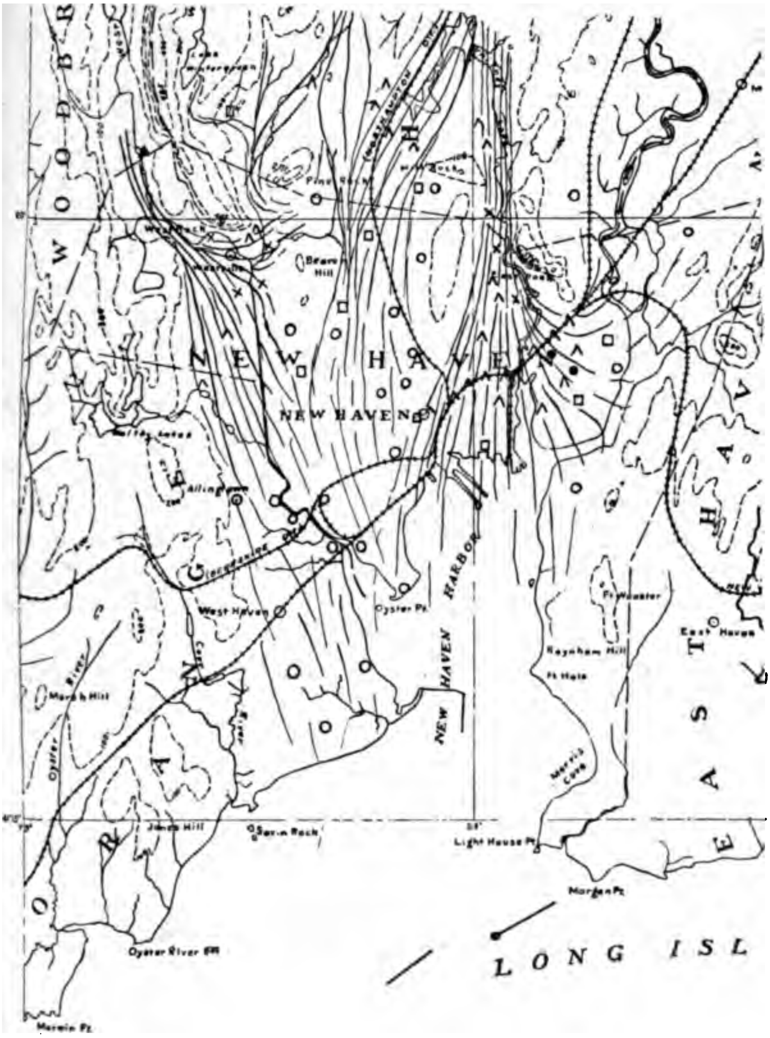


FIG. 15. Map showing location of currents which deposited stratified drift. The symbols are those used on Plate I.

Those seen around the New Haven plain have been considered by some as wave-cut, implying that the region was submerged and inundated by the sea. But they are obviously connected with the terraces seen in other parts of southern Connecticut, which stand at various levels. Subsidence that would have brought all the terraces to sea level would necessarily have been impossibly intricate and differential.

The terraces show very little dissection. This may mean that because of the very porous nature of most of the stratified drift waters soak in rather than erode; but it more likely means that the land was terraced rather late in the glacial period, and that erosion has not yet had sufficient time to accomplish much dissection.

SUMMARY OF CHARACTERISTICS OF TILL AND STRATIFIED DRIFT.

For the benefit of those who wish to distinguish till from stratified drift the following outline is offered for guidance:

Structure. Till is a heterogeneous mixture without bedding planes. Stratified drift lies in beds or layers.

Texture. Till is compact; usually has a clayey matrix; in many places contains large bowlders; has angular or subangular fragments that may be striated; has wide variation in size of fragments in a single exposure. Stratified drift is loose-textured; is usually sandy; large bowlders unusual; has rounded and "water-worn" fragments that never show striations; in any one exposure shows a limiting size to the fragments.

Topography. Till shows irregular or undulating topography, extensive flats are extremely unusual; is abundant on slopes and uplands; is never terraced. Stratified drift is commonly flat or has little relief; is typically along drainage lines, particularly the lowlands; is much terraced.

Depth. Till is usually 2 to 15 feet thick. Stratified drift is usually 20 to 75 feet thick.

Soils. Till is usually stony, strong, late. Stratified drift is usually sandy, light, early.

Swamps. They are common on till. They are much less common on stratified drift.

A, Glacial striations at Blakeslee's Quarry, Fair Haven Heights

B. Young peach orchard on stony till soil.

Since till and stratified drift vary in color, texture, composition, and thickness a single feature may be insufficient to differentiate them.

BEDROCK.

In some places bedrock appears at the surface, in others it is covered by more than 200 feet of drift. On the whole, solid rock is rather near the surface, as may be seen in Plate IX. In fully 75 per cent. of the New Haven region, excepting the broad valleys and the New Haven plain, rock lies within 20 feet of the surface. The rock surface is not jagged or intricately irregular, but presents broad, smooth curves in profile. In many places this undulating surface is marked by parallel grooves or scratches (see Pl. VIII, *A*). The significance of loose débris resting abruptly on solid rock will be best appreciated by considering the relations existing between rocks, weathering, and soils.

A significant feature of the bedrock in southern Connecticut is its freshness. Glacial drift lies directly upon solid unweathered rock. In unglaciated regions bedrock is rotted and decomposed at the top, forming a soil the depth of which depends upon the kind of rock, the climate, slope, and the length of time involved. Such soil, which must have formed the upper surface of rock in the New Haven region before the coming of the glacier, was stripped from the ledges by the moving ice sheet. In its place was deposited drift.

The ice not only scraped off the loose soil layer but also cut into the unweathered ledge to an appreciable extent. The rock fragments held in the lower part of the glacier were the graving tools which enabled it to dig into the rock, to gouge out depressions, and to make striations and grooves, which mark the direction of glacier movement. Most of these marks show that the movement was southwestward; another and rarer set shows a general southward movement (see Pl. I).

Though the two general trends of the striae may mean two advances of the glacier, it is probable that the variation is due to local modification of the general movement. It is known that large valleys whose general bearing does not depart widely from

the trend of a continental glacier can control the movement of the ice within its walls. Even minor irregularities of the rocky floor may exert a similar control, for example, at one place where the general direction of ice movement was S. 5° W. a small channel not more than 75 yards wide at the top and about 30 feet deep has modified the movement by 30°, the striae within the channel pointing S. 35° W., and on the top S. 5° W. One groove on the upper edge of this channel showed a transition without superposition of one set of striae on another.

PREGLACIAL TOPOGRAPHY.

Since the glacier has both taken away material from the rock and brought other material, it is obvious that the topography of the present day must be different from that in preglacial time, and it is possible to reconstruct this preglacial landscape. In order to do this we must in imagination remove all the loose glacial débris, leaving the solid rock bare, then add 10 to 50 feet of loose rock and soil to the ledge. Although many of the larger features would be much the same yet there would be changes, and some of them radical. The outline of the hills would be sharper and more irregular, the valleys would be narrower and have different slopes, and the flat New Haven plain would not then exist. In preglacial times the land of this region was evidently 200 feet higher than today, for none of the stratified drift is of marine deposition — as has already been shown — and its thickness in the New Haven plain is at least 200 feet.

DRAINAGE.

A glacial region has several characteristic drainage features. Lakes and swamps are common; stream courses have been shifted and otherwise modified.[1]

LAKES.

There are several lakes in the southern part of the Connecticut lowland. They measure the irregularity of deposition of drift, particularly of till. Wherever till is heaped indiscriminately

[1] Rice, W. N., and Gregory, H. E., Manual of the geology of Connecticut: Connecticut Geol. and Nat. Hist. Survey Bull. 6, pp. 247-254, 1906.

many small hollows and basins result, in which the water collects; or drift may block an otherwise open channel or natural drainage line, thus ponding the water. Many kettle holes, especially the deeper ones, hold small lakes. Lakes are not permanent features of the landscape. Their outlets may be cut down and the water drained away, or deposition may fill in and obliterate them.

SWAMPS.

These are more numerous than lakes. Many of them were formerly lakes which have been filled partly with sands and muds brought by streams, partly by the growth of aquatic vegetation, which starts from the margins and gradually builds out, in time covering the whole lake and converting it into a swamp.

Swamps not uncommonly are found on hill slopes where there never were any lakes and where the drainage seems sufficient to keep the slope dry. Swamps of this type owe their existence to the thinness and the close texture of drift. As water from rains or from melting snow sinks into the ground only a foot or so beneath the surface, it meets impervious rock. Most of the water is then forced to move along the rock surface and down the slope, and consequently the top layer of drift is kept soaked and the slope as a whole is swampy.

The same condition may prevail if the hill is composed of till, for much of the matrix of till is very fine and claylike and holds moisture very tenaciously; as a result the water does not soak in readily but is kept near the surface and causes a swamp. In contrast to this, stratified drift takes up water quickly because of its more open texture, and, if in an elevated position, a swamp will be formed only where a dense, claylike layer is not far below the surface.

The small lenses of sand that are found occasionally in masses of till become the trunk channels for water, and if they outcrop on a slope the water content will gradually seep out and produce a swampy spot.

All types of drift regardless of texture will eventually be surcharged with water if in favorable positions. At the margins of the shore, on tidal flats, and along flood plains of streams, swamps

are universally present, because the level of permanent ground water is at or near the surface and the water can not drain away unless the ground water level itself is lowered.

MODIFICATION OF DRAINAGE.

A comparison of the preglacial topography with the present topography shows that the larger streams of the New Haven region have been modified by the filling of their valleys with drift. For instance, in preglacial time Mill River did not pass through Lake Whitney but flowed to the west of Mill Rock, and the Quinnipiac Valley was a lake. Since the main body of drift was deposited minor shiftings of the streams across their valley flats have taken place. A short distance to the north, however, were modifications that had a direct influence on the drainage of this particular area.

POSTGLACIAL FEATURES.

Since the close of the glacial period, weathering, running water, and movements in the earth's crust have produced many changes in topography.

Weathering has been continually at work. As a result many of the bare ledges that once had glacial striae upon their surfaces no longer bear them, but the change has not usually been sufficient to obscure the general rounding and smoothing of the surface produced by the glacier. Some of the shaly sandstones have been affected to such an extent by weathering that soil has started to form upon them, and the loose bowlders and gravels and even the body of drift has become decomposed. The cover of drift has protected the bedrock below.

Minor changes along the stream courses have been caused by the shifting of meandering streams, a more considerable change by rainwash from the slopes to the lower levels. The effect produced is seen best where the flat-lying stratified drift meets the till-clad uplands. Rain falling on a slope will carry loose débris down to its foot and deposit it as an overlap of " wash," a process which has obscured the contact of till and stratified drift in a great many places.

That the land near New Haven has slowly been subsiding since the close of the glacial period is shown by the following evidence: in the swamp in the Quinnipiac Valley are the remains of buried tree stumps as much as 12 inches in diameter; they appear near the lower part of the peat deposit which overlies sand and clay. Though it is true that shallow waters marginal to the coast can be and are gradually converted to salt marsh and even to agricultural fields without any movement of the land, such a depth of water as is indicated by the tree stumps and the thickness of overlying peat would not normally support the growth of trees. The trees must have grown in soil, possibly containing excess moisture, but not in water. A gradual subsidence of the land inundated and submerged the trees and in this water peat was formed.

SEQUENCE OF EVENTS.

The geologic events in the southern part of the central lowland of Connecticut outlined chronologically are as follows:

1. Preglacial conditions. The land was probably 200 feet more or less higher than at present, as shown by depth of the deposit in the New Haven plain, none of which is marine. This general elevation persisted until the withdrawal of the glacier.

2. Approach of glacier. Melting of the approaching glacier increased erosion; valley floors were swept clean and also channeled, resulting in rock terraces in the tributaries.

3. Overriding of land by glacier. Collection of load, removal of loose soil, some cutting into rock; formation of striations, general rounding and smoothing; some deposition where the glacier was overloaded with ground moraine; and lamination of till took place. Preglacial topography was smoothed, bedrock was scraped, the Quinnipiac rock basin was formed.

4. Withdrawal of glacier. General deposition of till. Morainal deposits formed at places where retreat was halted. Dams formed at the southern end of West Rock Ridge and at Mount Carmel. Till worked over by glacial waters; stratified drift collected, carried, and deposited; three periods of deposition.

(a) Deposition of clay. This took place while the ice front was not far north of Cheshire and Yalesville. The Quinnipiac

was a closed basin holding a lake and receiving a regular supply from the melting glacier in addition to drainage from the sides of the basin. The other valleys had too rapid currents to allow much deposition of clay.

(b) Deposition of lower sands. More vigorous streams entered the Quinnipiac Valley depositing sands over the clays. In the other valleys the lower sands were accumulating during and after the formation of the Quinnipiac clays.

(c) Deposition of upper gravels. The change from the period of lower sands to the upper gravels involved an unknown but not excessive amount of time. No interglacial period is implied. A very decided change in the volume and velocity of the currents took place, due to a marked increase in the rate of melting of the glacier as it withdrew toward the Southington position, combined probably with some climatic change.

5. Terracing. An interval of time elapsed between the withdrawal of the ice and the terracing. This period of erosion may have been due to uplift but more likely either to climatic changes or loss of load of the streams.

6. Recent events. Final subsidence with inundation of river valleys in their lower extremities. Formation of peat and salt marsh, also "wash." Conditions of weathering about as at present.

Whether the subsidence was progressive, starting during or after event number 4, or whether it was localized in point of time, is very uncertain.

SOILS.

ORIGIN.

Soil is the loose, rocky débris found on the surface of the earth and usually capable of supporting a growth of vegetation. All soils have been derived in one way and another from solid rock.

The process by which rock is broken down to soil is slow and gradual, involving both chemical and mechanical forces. Just as the walls of many old stone buildings which have stood for 50 or 100 years have started to crumble under the action of the

weather, so has the solid ledge of the earth slowly fallen to pieces when exposed to sun, moisture, rain, gases of the air, frost, and wind. Exposed portions of rock are reduced to fragments and the fragments in turn to smaller and smaller pieces.

In many places, as in some quarry or railroad cut, the solid rock can be traced upward through all gradations from unaltered rock, rotten rock, and subsoil to the true soil on top. Such soils that have been derived from the rock directly beneath are described as having been formed in situ or in place. They are practically lacking in this region. Soils that have been carried from their place of origin and deposited elsewhere are called transported soils. The agents of transport are rain, streams, wind, and glaciers. In Connecticut the soils are predominantly transported, and glaciers have been the chief agents.

SOIL FACTORS.

There are certain factors or properties which give to a soil its character and determine its value.

Composition. Certain chemical elements are needed by growing vegetation and if lacking the full development of a plant is hindered. But almost every soil contains all the necessary elements in varying amounts and combinations. This is probably the least disturbing soil factor, at any rate glacial action controls it less than any of the factors.

Texture. The texture of the soil (gravelly, sandy, loamy, clayey, loose, open, compact, or firm), determines its water holding capacity, the amount of plant food dissolved in a given time, the relative freedom of root penetration, and the aeration of the soil.

Nature of Bed Rock. Soils formed in place have certain qualities derived from the parent ledge, but transported soils have no definite relation to the rock surface beneath, except where the distance of transportation is slight or where one kind of rock persists over a large area.

Position. The topographic position of a soil is an important factor. A soil that is constantly flooded becomes so clogged with water that it can produce only a specialized type of vegetation.

Sluggish drainage in enclosed basins, on flats so level that surface waters can scarcely move across them, or directly above an impervious clay layer may spoil an otherwise good soil. Neither is soil productive when too well drained. For this reason some terraces are less productive than the neighboring flood plain. Soil on a steep slope, where the loss of water is great on account of the excessive run-off, is more likely to be removed by erosion than soil on a more gentle incline. The run-off is at a minimum or zero on a level. Soil on slopes is subject to loss of water and also to rapid removal by rainwash. The direction and degree of slope are responsible in a measure for the temperature of the soil.

Depth. A thin soil resting on rock has distinct disadvantages. Root growth is restricted, extremes of temperature and moisture are frequent, plant food is small in amount, and entire loss by erosion is possible.

Humus. The partially decayed organic matter in the soil, known as humus, is valuable in several ways. It is a texture modifier, improving both coarse sandy and heavy clay soils; it is a good water holder; it contains valuable plant food, particularly nitrogen; and is of service in other ways.

No one of these factors operates to the exclusion of the others, but all combine and interact to a greater or less degree. Much variety in the soils of even a small area results. There is a close relation between geologic features and soil values.

COMPARATIVE VALUE OF TILL AND STRATIFIED DRIFT.

For agricultural soil, till is better than stratified drift in the following respects.

(a) Till is finer grained, contains more silt and clay; therefore it holds moisture better than stratified drift, and yields to solution more readily.

(b) Till is made up of mechanically derived material ground small during transportation with a minimum of loss by solution. Stratified drift, on the other hand, by being carried in the water so that it is partly decomposed, is robbed of material useful to plants.

(c) Till in some ways occupies a better position. Its location, mainly on uplands and hill slopes, causes better drainage — fewer

swamps are found on a slope than on a flat. Wherever it has the advantage of position and slope, till excels stratified drift.

But till may also be poorer than stratified drift as a soil maker. In many places till is so stony that its agricultural value is impaired or spoiled. The presence of large-sized stones and bowlders lessens the workable acreage, and their increase in number causes agriculture to become more and more of a problem, until in many instances a field has no value except for pasturage. From some land, bowlders have been removed or used for fences, a solution for the problem involving an amount of labor and energy which could have brought about many other and more important improvements. (See Pl. VIII, *B*). Fields of stratified drift have few bowlders.

The compact texture of some till hinders cultivation and also prevents a proper spread of roots. The very fine texture of till though insuring good water-holding power may because of that very fact be a disadvantage where the soils are naturally poorly drained; and too much water makes soil cold and late.

Although a slope insures proper drainage, it may aid erosion to the detriment of the soil. Such slopes are more frequent in till than stratified drift.

This area has not only more outcrops of ledge in till than in stratified drift, but in many places the till covering is only a few inches or a foot thick.

The good qualities that till usually possesses may be spoiled by admixture with local material, much of which is sandstone yielding a poor soil. This feature is more likely to be of importance where till is thin.

VARIETY OF SOILS.

Although the general characteristics of till soil are different from those of stratified drift, it does not follow that all the soils on till, for instance, are alike. In fact, even a small farm, whether wholly on till or wholly on stratified drift, may have a great variety of soils.

A knowledge of the origin and characteristics of the two deposits is the foundation from which more detailed and definite explanations can be made. Glacial geology will explain part,

and other lines of study — some geologic and some not — will be needed to effect the solution; many local influences necessitate separate consideration for each problem.

Two illustrations are given here to help make clear how easily a considerable variety in a single region of small dimensions can

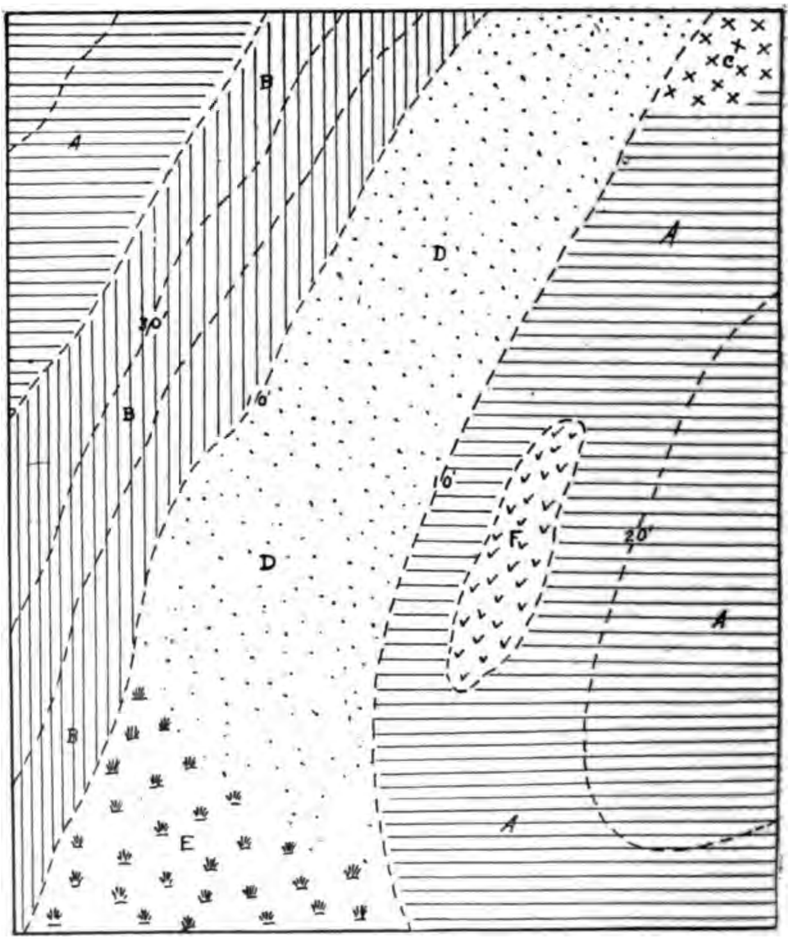


Fig. 16. Diagram showing soil variety in till in type locality. Width of map 500 yards. Contour interval 10 feet. The symbols and letters have the following meaning: *A*, Gentle slopes in upland covered with unmodified till; *B*, Steep slopes covered with modified till; *C*, Bowlders; *D*, Lowland with covering of fine materials washed from slopes; *E*, Swamp; *F*, Rise with normal till covering sandstone ledge.

exist, and how the various soil factors are related to the situation. The instances cited are a composite of actual conditions seen in this area and will serve to show how the subject may be approached.

A. Variety in Till (see fig. 16).

Since this locality is in the till belt the general features of that material will be expected — the fine loamy or claylike texture, with a certain amount of stones and larger rock fragments and some large bowlders. But besides this, close examination reveals six different kinds of soil, the result of local variations of till and modification of the original till deposit.

The flat or gentle sloped uplands are covered with unmodified till, fine-textured and somewhat stony. In the northeast part is a small spot freely sprinkled with large bowlders. The steeper slopes are covered with what can be called modified till, the result of increased slope, in consequence of which the rainfall has gained sufficient velocity to wash away much of the finer part of till, leaving behind large stones and fragments. Hence, this part of till has lost quality and is found to be very freely sprinkled with stones. The finer material washed from the slope has been spread out and deposited in the lowest part of the locality, making a fine-textured, even soil of excellent quality and free from stones, but it is not so thick everywhere but that the plow will occasionally throw out one of the stones from the till below. In the southern part of this flat the drainage is so poor that a swamp has developed. The elongated rise of ground in the midst of the normal till is a spot where sandstone ledge is very near the surface; in consequence, the till soil is not only thin but has had its quality impaired by admixture of sandy material from the parent ledge locally scraped up by the glacier. The contacts between the soil types are nowhere absolutely sharp.

B. Variety in Stratified Drift (see fig. 17).

Here the topography is different from that of till — two flats at different levels separated by a rather steep terrace front. Since this locality is assumed as being in stratified drift, different grades of sands and possibly gravel, depending on the velocity of the streams that carried and deposited the material, will be expected.

The main part of the lower flat is a fine sandy soil of good quality; but through the midst of it is a broad strip of gravel, marking the position of a swifter flowing current; on the margin of this is finer gravel and coarse sand, and narrowing bands of

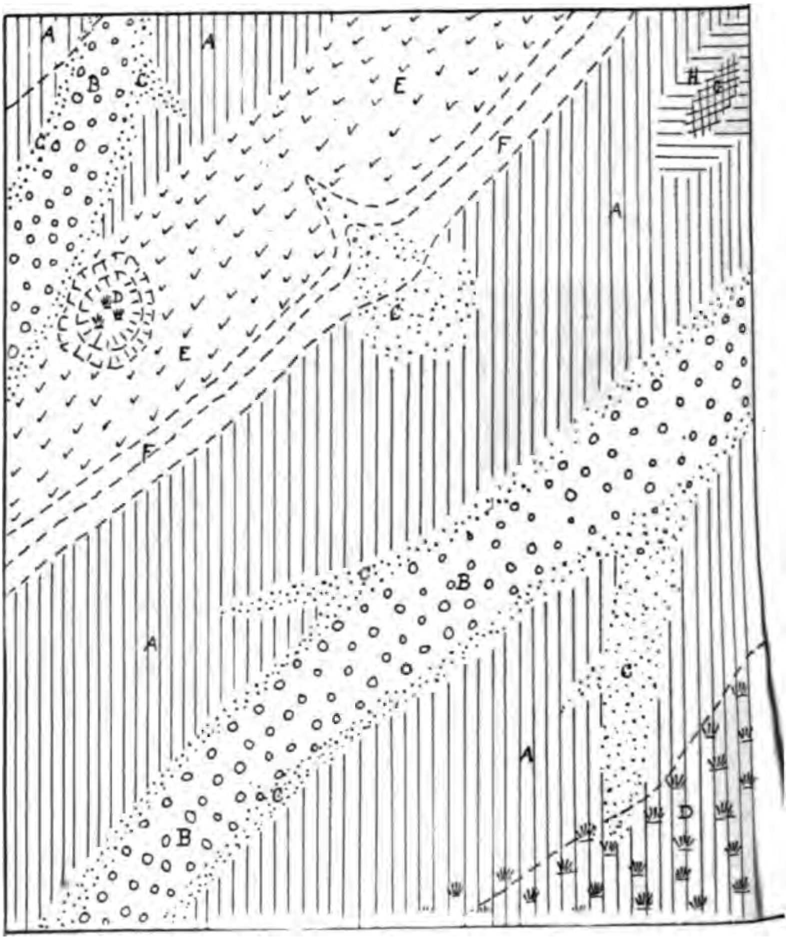


FIG. 17. Diagram showing soil variety in stratified drift in type locality. Width of map 500 yards. Contour interval 10 feet. The symbols and letters have the following meaning: *A*, Flat covered with fine sandy, good soil; *B*, Gravel; *C*, Fine gravel and coarse sand; *D*, Swamp; *E*, Texture like *A* but with lower water table; *F*, Terrace front; *G*, Till not completely covered with stratified drift; *H*, Area influenced by till.

the same material branch off from the main current portion for varying distances. More of the coarse sand and fine gravel was washed from the upper terrace and spread on the lower flat when the small gorge was cut. In the southeast part, a swamp spoils some little acreage. On the upper flat is a similar fine sandy soil with a band of gravel and coarse sand cutting across it. The circular depression is a kettle hole with rather steep sides and a swampy bottom. That part of the terrace designated by v's is similar in texture to the main part of the flat, but the water table is so much lower that the soil can stand but little drought, and its cropping value is markedly lowered. The terrace front is too steep for profitable cultivation, as are also the sides of the kettle hole. A spot of till is shown which is not completely covered by stratified drift. Its influence extends for some little distance in every direction, for although stratified drift is immediately next to it, till is directly below and controls the crop just as a clayey subsoil would.

Many local features in any restricted region will give more variety than is outlined in these two illustrations; or, again, only a part of such conditions may obtain and thus cause less variability.

RECLAMATION.

Man is constantly modifying his environment. The farmer nearly always has to do something to his soil before he can expect returns. A field may have to be cleared of stumps or stones, or fertilizers of several kind may have to be added. One field of endeavor, however, will bring in thoroughly adequate results for the time and money expended, and that is reclamation. Soils may be reclaimed if they are too dry or too wet — reclamation is reducing extreme to mean conditions. This is less needed on a large scale in Connecticut, perhaps, but there is hardly a farm that has not some field that would be improved by addition of a little water during the active growing season; and often there are natural means of irrigation close at hand. The reverse, also, is true. There are few farms in Connecticut that do not have

some lost land due to the presence of swamp. A glacial region usually has abundant swamp spots, and Connecticut is no exception in this respect. It has been found cheaper to drain swamp-land and make it fit for a good crop than to irrigate arid land, acre for acre, and it would probably be less laborious to drain a swamp than to clear a stony field.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25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914.

26. The Arthrostraca of Connecticut: by Beverly Waugh Kunkel.

27. Seventh Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1915-1916.

28. Eighth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1917-1918.

29. The Quaternary Geology of the New Haven Region, Connecticut: by Freeman Ward, Ph.D.

30. Drainage, Modification and Glaciation in the Danbury Region, Connecticut: by Ruth Sawyer Harvey, Ph.D.

31. Check List of the Insects of Connecticut: by Wilton Everett Britton, Ph.D. (In press.)

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Bulletin 484. The Granites of Connecticut: by T. Nelson Dale and Herbert E. Gregory.

Water-Supply Paper 374. Ground Water in the Hartford, Stamford, Salisbury, Willimantic and Saybrook Areas, Connecticut: by Herbert E. Gregory and Arthur J. Ellis.

Water-Supply Paper 397. Ground Water in the Waterbury Area, Connecticut: by Arthur J. Ellis, under the direction of Herbert E. Gregory.

These papers may be obtained from the Director of the United States Geological Survey at Washington.

CATALOGUE SLIPS.

Connecticut. State geological and natural history survey.

Bulletin no. 30. Drainage Modifications and Glaciation in the Danbury Region, Connecticut. By Ruth S. Harvey, Ph.D. Hartford, 1920.

59 pp., 5 pls., 10 figs., 25^{cm}.

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State of Connecticut

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HERBERT E. GREGORY, SUPERINTENDENT

BULLETIN No. 30

HARTFORD
Printed by the State Geological and Natural History Survey
1920

State Geological and Natural History Survey

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Drainage Modifications and Glaciation in the Danbury Region Connecticut

By

RUTH SAWYER HARVEY, Ph. D.

HARTFORD
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1920

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ILLUSTRATIONS.

INTRODUCTION

The Danbury region of Connecticut presents many features of geographic and geologic interest. It may be regarded as a type area, for the history of its streams and the effects of glaciation are representative of those of the entire State. With this idea in mind, the field work on which this study is based included a traverse of each stream valley and an examination of minor features, as well as a consideration of the broader regional problems. Much detailed and local description, therefore, is included in the text.

The matter in the present bulletin formed the main theme of a thesis on "Drainage and Glaciation in the Central Housatonic Basin" which was submitted in partial fulfillment of the requirements for the degree of doctor of philosophy at Yale University.

The field work was done in 1907 and 1908 under the direction of Professor Herbert E. Gregory. I am also indebted to the late Professor Joseph Barrell and to Dr. Isaiah Bowman for helpful cooperation in the preparation of the original thesis, and to Dr. H. H. Robinson for assistance in preparing this paper for publication.

DRAINAGE MODIFICATIONS AND GLACIATION IN THE DANBURY REGION, CONNECTICUT

By Ruth S. Harvey

REGIONAL RELATIONS

The region discussed in this bulletin is situated in western Connecticut and is approximately 8 miles wide and 18 miles long in a north-south direction, as shown on fig. 1.[1] Throughout, the rocks are crystalline and include gneiss, schist, and marble — the metamorphosed equivalents of a large variety of ancient sedimentary and igneous rocks.

For the purposes of this report, the geologic history may be said to begin with the regional uplift which marked the close of the Mesozoic. By that time the mountains formed by Triassic and Jurassic folding and faulting had been worn down to a peneplain, now much dissected but still recognizable in the accordant level of the mountain tops.

Erosion during Cretaceous time resulted in the construction of a piedmont plain extending from an undetermined line 30 to 55 miles north of the present Connecticut shore to a point south of Long Island.[2] This plain is thought to have been built up of unconsolidated sands, clays, and gravels, the débris of the Jurassic mountains. Inland the material consisted of river-made or land deposits; outwardly it merged into coastal plain deposits. When the plain was uplifted, these loose gravels were swept away. In New York, Pennsylvania, and New Jersey, however, portions of the Cretaceous deposits are still to be found. Such deposits are present, also, on the north shore of Long Island, and a well drilled at Barren Island on the south shore revealed not less than 500 feet of Cretaceous strata.[3] The existence of such thick deposits within 30 miles of the Connecticut shore and certain

[1] The streams and other topographic features of the Danbury region are shown in detail on the Danbury and the New Milford sheets of the United States Topographic Atlas. These sheets may be obtained from the Director of the United States Geological Survey, Washington, D. C.

[2] It was probably not less than 30 miles, for that is the distance from the mouth of Still River, where the Housatonic enters a gorge in the crystallines, to the sea. Fifty-five miles is the distance to the sea from the probable old head of Housatonic River on Wassaic Creek, near Amenia, New York.

[3] Veatch, A. C., Slichter, C. S., Bowman, Isaiah, Crosby, W. O., and Horton, R. E., Underground water resources of Long Island: U. S. G. S., PP. 44, p. 188 and fig. 24, 1906.

peculiarities in the drainage have led to the inference that the Cretaceous cover extended over the southern part of Connecticut.

A general uplift of the region brought this period of deposition to a close. As the peneplain, probably with a mantle of Cretaceous deposits, was raised to its present elevation, the larger streams kept pace with the uplift by incising their valleys. The position of the smaller streams, however, was greatly modified in the development of the new drainage system stimulated by the uplift. The modern drainage system may be assumed to have been at first consequent, that is, dependent for its direction on the slope of the uplifted plain, but it was not long before the effect of geologic structure began to make itself felt. In the time when all the region was near baselevel, the harder rocks had no advantage over the softer ones, and streams wandered where they pleased. But after uplift, the streams began to cut into the plain, and those flowing over limestone or schist deepened, then widened their valleys much faster than could the streams which flowed over the resistant granite and gneiss. By a system of stream piracy and shifting, similar to that which has taken place throughout the Newer Appalachians, the smaller streams in time became well adjusted to the structure. They are of the class called subsequents; on the other hand, the Housatonic, which dates at least from the beginning of the uplift if not from the earlier period of peneplanation, is an antecedent stream.

The complex rock surface of western Connecticut had reached a stage of mature dissection when the region was invaded by glaciers.[1] The ice sheet scraped off and redistributed the mantle of decayed rock which covered the surface and in places gouged out the bedrock. The resulting changes were of a minor order, for the main features of the landscape and the principal drainage lines were the same in preglacial time as they are today. It is thus seen that the history of the smaller streams like those considered in this report involves three factors: (1) the normal tendencies of stream development, (2) the influence of geologic structure, and (3) the effect of glaciation.

The cover of glacial deposits is generally thin, but marked variations exist. The fields are overspread with coarse till containing pebbles 6 inches in diameter to huge boulders of 12

[1] This stage of glaciation is presumably Wisconsin. No definite indication of any older glacial deposits was found.

feet or more. The abundance, size, and composition of the boulders in the till of a given locality is well represented by the stone fences which border fields.

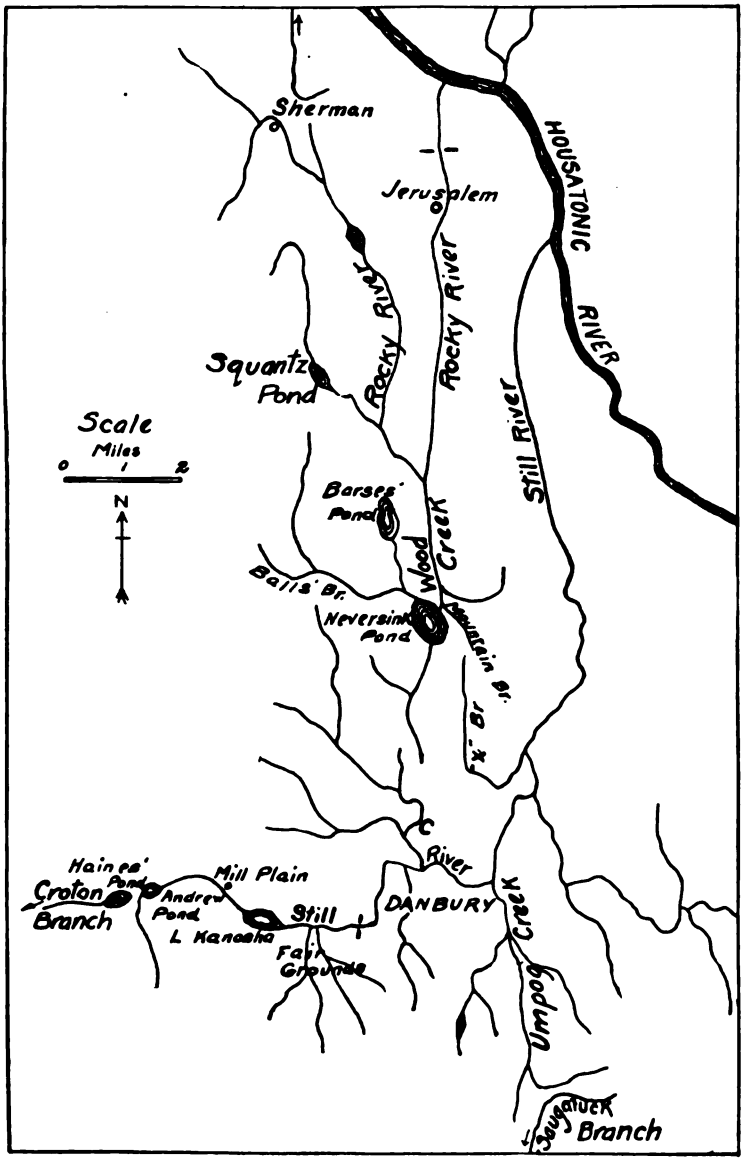

FIG. 1. Present drainage of the Danbury region.

The regional depression which marked the close of the glacial period slackened the speed of many rivers and caused them to deposit great quantities of modified or assorted drift. Since glacial time, these deposits have been dissected and formed into the terraces which are characteristic of the rivers of the region. A form of terrace even more common than the river-made terrace is the kame terrace found along borders of the lowlands. Eskers in the Danbury region have not the elongated snake-like form by which they are distinguished in some parts of the country, notably Maine; on the contrary, they are characteristically short and broad, many having numerous branches at the southern end like the distributaries of an aggrading river. The material of the eskers ranges from coarse sand to pebbles four inches in diameter, the average size being from one to two inches. No exposures were observed which showed a regular diminution in the coarseness of the material toward their southern end. The clean-washed esker gravels afford little encouragement to plant growth, and the rain water drains away rapidly through the porous gravel. Consequently, accumulations of stratified drift are commonly barren places. A desert vegetation of coarse grasses, a kind of wiry moss, and " everlastings " (*Gnaphalius decurrens*) are the principal growth. Rattlebox (*Crotolaria sagittalis*), steeplebush (*Spiraea tomentosa*), sweet fern (*Comptonia asplenifolia*), and on the more fertile eskers — especially on the lower, wetter part of the slope — golden rod, ox-eyed daisy, birch, and poplar are also present. All the eskers observed were found to be similar: they ranged in breadth across the top from 100 to 150 feet and the side slopes were about 20 degrees. Only a single heavily wooded esker was found, and this ran through a forest region.

The accumulations of stratified drift are distinguished from other features in the landscape by their smoother and rounder outlines, by their habit of lying unconformably on the bedrock without reference to old erosion lines, and by a slightly different tone in the color of the vegetation covering the water-laid material. The difference in color, which is due to the unique elements in the flora of these areas, may cause a hill of stratified drift in summer to present a lighter green color than that of surrounding hills of boulder clay or of the original rock slopes; in winter the piles of stratified drift stand out because of the uniform light tawny red of the dried grass.

View south on the highland northeast of Neversink Pond. The base of a ridge in which rock is exposed is seen at the left; a crescent-shaped lateral moraine bordering the valley lies at the right.

ROCKY RIVER

DESCRIPTION OF THE RIVER AND ITS VALLEY

Rocky River begins its course as a rapid mountain brook in a rough highland, where the mantle of till in many places is insufficient to conceal the rock ledges (fig. 1). Near Sherman, about four miles from its source, it enters a broad flood plain and meanders over a flat, swampy floor which is somewhat encumbered with deposits of stratified drift and till. Rocky hills border the valley and rise abruptly from the lowland. The few tributaries of the river in this part of its course are normal in direction.

About six miles below Sherman, Rocky River enters Wood Creek Swamp, which is 5½ miles long by about one mile wide and completely covers the valley floor, extending even into tributary valleys. Within the swamp the river is joined by Squantz Pond Brook and Wood Creek. Tributaries to Wood Creek include Mountain Brook and the stream passing through Barses Pond and Neversink Pond. The head of Barses Pond is separated from the swamp only by a low ridge of till. Neversink Pond with its inlet gorge and its long southern tributary record significant drainage modifications, as described in the section entitled "The Neversink-Danbury Valley."

Within and along the margin of Wood Creek Swamp, also east of Wood Creek and at Barses Pond, are rounded, elongated ridges of till, some of which might be called drumlins. East of Neversink Pond is the lateral moraine shown in Pl. I. From the mouth of Wood Creek to Jerusalem, Rocky River is a quiet stream wandering between low banks through flat meadows, which are generally swampy almost to the foot of the bordering hills.

Near Jerusalem bridge two small branches enter Rocky River. Immediately north of the bridge is a level swampy area about one-half mile in length. Where the valley closes in again, bedrock is exposed near the stream, and beginning at a point one-half mile below (north of) Jerusalem, Rocky River — a swift torrent choked by boulders of great size — deserves its name.

In spite of its rapid current, however, the river is unable to move these boulders, and for nearly three miles one can walk dry-shod on those that lie in midstream.

At two or three places below Jerusalem, in quiet reaches above rapids, the river has taken its first step toward making a flood plain by building tiny beaches. One-half mile above the mouth of the river the valley widens and on the gently rising south bank there are several well-marked terraces about three feet in height and shaped out of glacial material. A delta and group of small islands at the mouth of Rocky River indicate the transporting power of the stream and the relative weakness of the slow-moving Housatonic.

RELATIONS OF THE VALLEY TO GEOLOGIC STRUCTURE

Rocky River is classed with streams which are comformable to the rock structure. This conclusion rests largely on the analogy between Rocky River and other rivers of this region. The latter very commonly are located on belts of limestone, or limestone and schist, and their extension is along the strike. The interfluvial ridges are generally composed of the harder rocks. The valleys of the East Aspetuck and Womenshenuck Brook on the north side of the Housatonic, and of the Still, the Umpog, Beaver Brook, the upper Saugatuck, and part of Rocky River are on limestone beds (fig. 2). In the valleys between Town Hill and Spruce Mountain (south of Danbury), two ravines northwest of Grassy Plain (near Bethel), and the Saugatuck valley north of Umpawaug Pond, the limestone bed is largely buried under drift, talus, and organic deposits, but remnants which reveal the character of the valley floors have been found. The parallelism between the courses of these streams and that of Rocky River and the general resemblance in the form of their valleys, flat-floored with steep-sided walls, as well as the scattered outcrops of limestone in the valley, have led to the inference that Rocky River, like the others, is a subsequent stream developed on beds of weaker rock along lines of foliation.

The Geological Map of Connecticut[1] shows that the valleys of Still River, Womenshenuck Brook, Aspetuck River, and upper

[1]Gregory, H. E., Robinson, H. H., Preliminary geological map of Connecticut; Geol. and Nat. Hist. Survey. Bull. 7, 1907.

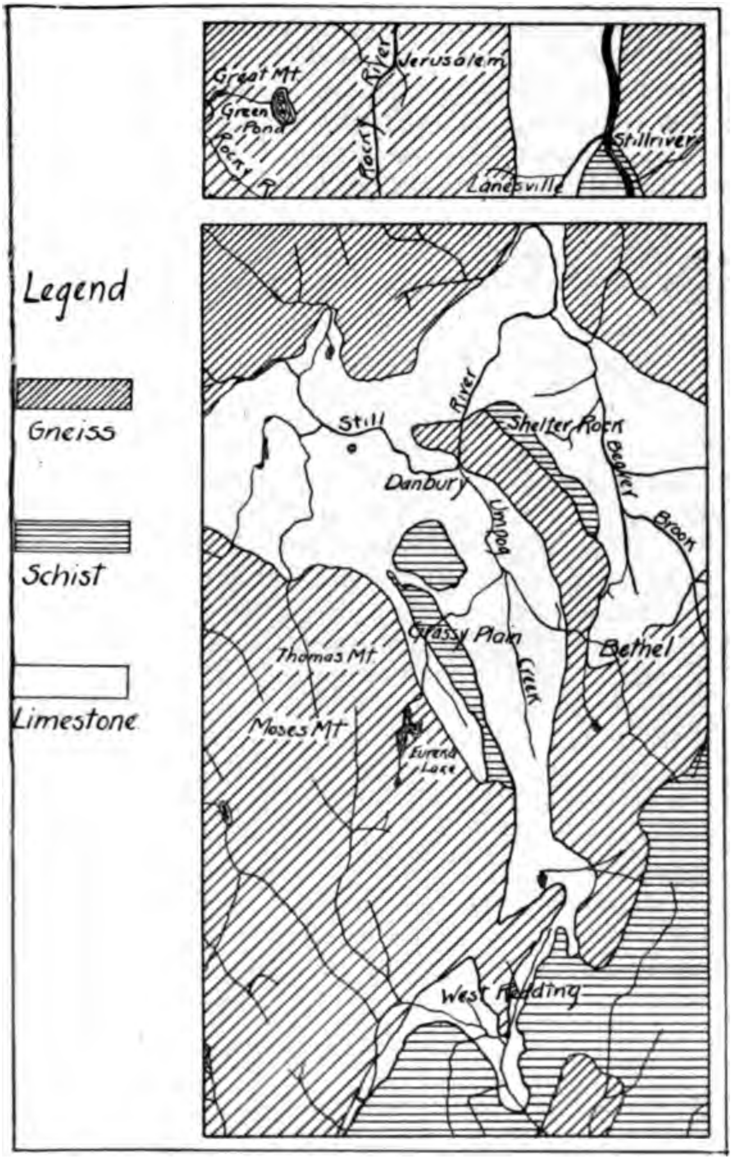

Fig. 2. Geological map of Still River Valley.

Rocky River are developed on Stockbridge limestone. The lower valley of Rocky River is, however, mapped as Becket gneiss and Thomaston granite gneiss. Although the only outcrops along lower Rocky River are of granite, it is believed that a belt of limestone or schist, now entirely removed, initially determined the course of the river. The assumption of an irregular belt of limestone in this position would account for the series of gorges and flood plains in the vicinity of Jerusalem bridge and for the broad drift-filled valley at the mouth of Rocky River. These features are difficult to explain on any other basis.

JUNCTION OF ROCKY AND HOUSATONIC RIVERS

One of the distinguishing features of Rocky River is the angle at which it joins the Housatonic (fig. 1). The tributaries of a normal drainage system enter their master stream at acute angles, an arrangement which involves the least expenditure of energy. Rocky River, however, enters the Housatonic against the course of the latter, that is, the tributary points upstream. Still River and other southern tributaries of the Housatonic exhibit the same feature, thus producing a barbed drainage, which indicates that some factor interfered with the normal development of tributary streams. Barbed drainage generally results from the reversal of direction of the master stream[1], but it is impossible to suppose that the Housatonic was ever reversed. As will appear, it is an antecedent master stream crossing the crystalline rocks of western Connecticut regardless of structure, and its course obliquely across the strike accounts for the peculiar orientation of its southern tributaries, which are subsequent streams whose position is determined by the nature of the rock. For the same reason, the northern tributaries of the Housatonic present the usual relations.

ABNORMAL PROFILE

The airline distance from the bend in Rocky River at Sherman to its mouth at the Housatonic is 2¾ miles, but the course of the

[1] Leverett, Frank, Glacial formations and drainage features of the Erie and Ohio basins: U. S. Geol. Survey Mon. 41, pp. 88-91, figs. 1 and 2, 1902. See, also, the Genoa, Watkins, Penn Yan, and Naples (New York) topographic atlas sheets.

river between these two points is 15 miles, or 5.4 times the air-line distance. This is a more extraordinary digression than that of Tennessee River, which deserts its ancestral course to the Gulf and flows northwest into the Ohio, multiplying the length of its course $3\frac{1}{3}$ times. The fall of Rocky River between Sherman and its mouth is 240 feet or 16 feet to the mile, and were the river able to take a direct course the fall would be 87 feet to the mile. The possibility of capture would seem to be imminent from these figures, but in reality there is no chance of it, for an unbroken mountain ridge of resistant rock lies between the two forks of the river. This barrier is not likely to be crossed by any stream until the whole region has been reduced to a peneplain.

Measured from the head of its longest branch, Rocky River is about 19 miles long and falls 950 feet. Of this fall, 710 feet occurs in the first 4 miles and 173 feet in the last $2\frac{1}{2}$ miles of its course. For the remaining distance of $12\frac{1}{2}$ miles, in which the river after flowing south doubles back on itself, the fall is 67 feet, or slightly less than $5\frac{1}{2}$ feet to the mile (fig. 3, A).

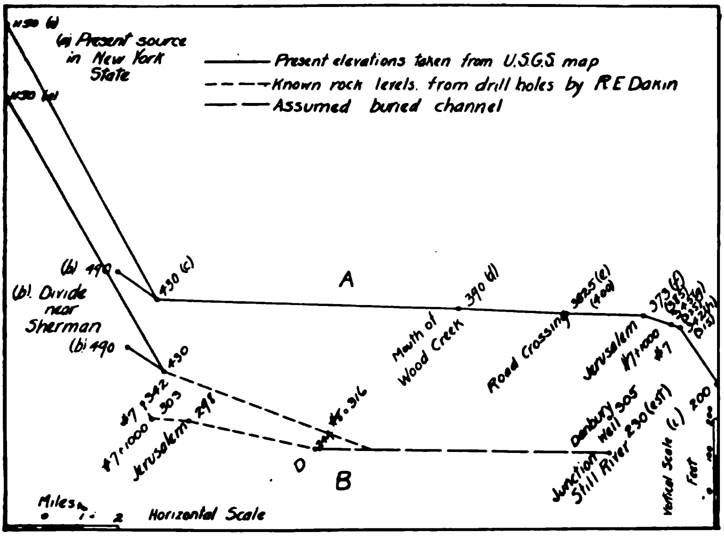

FIG. 3. Profiles of present and preglacial Rocky River.
Elevations at a, b, c and i are from U. S. G. S. map. Elevation at d is estimated from R. E. Dakin's records. Elevations at e, f, g and h are from R. E. Dakin's records. The U. S. G. S. figures for the same are enclosed in parenthesis.

In tabular form the figures, taken from the Danbury and New Milford atlas sheets and from reports of R. E. Dakin, are as follows:

	Miles	Fall in feet per mile
Source to Sherman	4	177.5
Sherman to Wood Creek	8	6.25
Wood Creek to Jerusalem	4.5	3.8
Jerusalem to mouth	2.5	69.2

Near Jerusalem, where Rocky River makes its sudden change in grade, there is an abrupt change in the form of the valley from broad and flat-bottomed to narrow and V-shaped. The profile of Rocky River is thus seen to be sharply contrasted with that of a normal stream, which is characterised throughout its course by a decreasing slope.

PREGLACIAL COURSE

The present profile of Rocky River and the singular manner in which the lower course of the river is doubled back on the upper course are believed to represent changes wrought by glaciation. Before the advent of the glacier, Rocky River probably flowed southward through the "Neversink-Danbury Valley," to be described later, and joined the Still at Danbury, as shown in fig. 4. The profile of the stream at this stage in its history is shown in fig. 3, B.

At Sherman a low col separates Rocky River basin from that of the small northward flowing stream which enters the Housatonic about a mile below Gaylordsville. Streams by headward erosion at both ends of the belt of limestone and schist on which they are situated have reduced this divide to an almost imperceptible swell. The rock outcrops in the channel show that the glacier did not produce any change in the divide by damming, though it may have lowered it by scouring. Assume that at one time a divide also existed on the eastern fork of Rocky River, for example near Jerusalem. According to this hypothesis there was, north of this latter divide, a short northward flowing branch of the Housatonic located on a belt of weak rock, similar to the

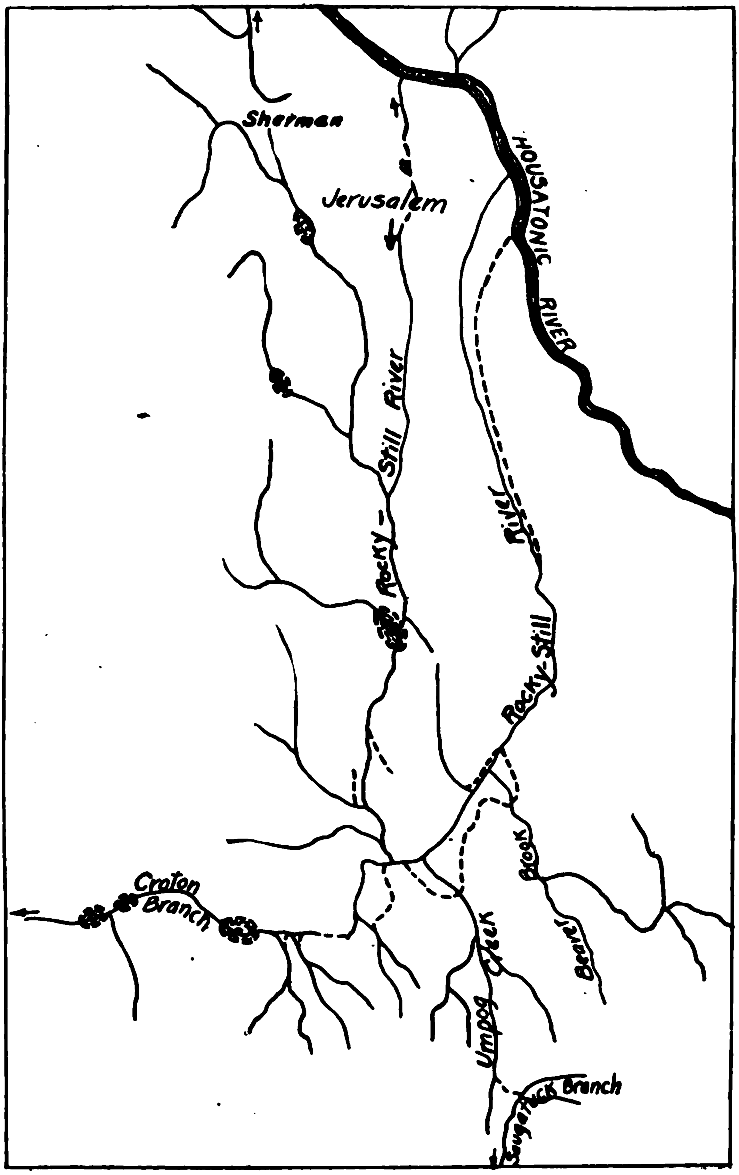

FIG. 4. Preglacial course of Rocky-Still River. Dotted lines show present courses of the two rivers.

small stream which now flows northward from Sherman, and very like any of the half-dozen parallel streams in the rock mass south and southwest of Danbury, all of which are subsequent streams flowing along the strike. While these stream valleys were growing, the southern ends of the same weak belts of rock were held by southward-flowing streams which united in the broad limestone area now occupied by the city of Danbury.

The southward-flowing streams whose heads were, respectively, above Sherman and near Jerusalem joined at the southern end of the long ridge which includes Towner Hill and Green Mountain. Thence the stream flowed southward along the valley now occupied by Wood Creek and reached Still River by way of the valley which extends southward from Neversink Pond (fig. 4).

The preglacial course of Rocky River, as above outlined, is subject to possible modification in one minor feature, namely, the point where the east and west forks joined. The junction may have been where Neversink Pond is now situated, or three miles farther south than the indicated junction near the mouth of Wood Creek. A low ridge of till is the only barrier that at present prevents the western branch from flowing into the head of Barses Pond and thence into Neversink Pond (fig. 1).

As thus reconstructed the greater part of Rocky River formerly belonged to the Still-Umpog system and formed a normal tributary in that distant period when the Still joined the Saugatuck on its way to the Sound (fig. 9). However, the normal condition was not lasting, for the reversal of Still River, as later described, brought about a complex arrangement of barbed streams (fig. 4) which remained until modified by glacial action.

In a large stream system which has been reversed, considerable evidence may be gathered from the angle at which tributary streams enter. As the original direction of Rocky River in its last 2½ miles is unchanged, normal tributaries should be expected; whereas between Jerusalem and the head of the stream entering Neversink Pond from the south, in accordance with the hypothesis that this portion of the stream was reversed, tributaries pointing upstream might be expected. Such little gullies as join Rocky River near its mouth are normal in direction; between Jerusalem and the mouth of Wood Creek, a distance of 4½

miles, there are no distinct tributaries. South of the mouth of Wood Creek are four tributaries: (1) the brook which enters the valley from the west about one mile south of Neversink Pond, (2) Balls Brook, which empties into Neversink Pond, and (3) two streams on the east side — Mountain Brook and one other unnamed (fig. 1). All these, except Mountain Brook, are normal to the reconstructed drainage. The evidence of the tributaries, though not decisive, is thus favorable to the hypothesis of reversal.

THE BURIED CHANNEL

Figures 3 and 5 show what is known of the buried channel of Rocky River. The only definite information as to rock levels is that derived from the drill holes made by R. E. Dakin for the J. A. P. Crisfield Contracting Company in connection with work on a reservoir for the Connecticut Light and Power Company. Numerous holes were drilled at the points indicated on fig. 5 as No. 8, D, J, No. 7 + 1000, and No. 7, but only those showing the lowest rock levels need be considered. In the following account the elevations quoted are those determined by R. E. Dakin which differ, as shown in fig. 3, A, from those of the New Milford atlas sheet.

Between the mouth of Wood Creek and Jerusalem bridge holes made near the river show that the depth of the drift — chiefly sand, gravel, and clay — varies from 45 to 140 feet. The greatest thickness of drift, consisting of humus, quicksand and clay, is 140 feet at a point 20 feet from the east bank of Rocky River and about 1¾ miles north of the mouth of Wood Creek (fig. 5, D). Although some allowance should be made for glacial scouring, the rock level at this point, 244 feet, is so much lower than any other record obtained between this point and Danbury that one is obliged to assume a buried channel with a level at Danbury at least 75 feet below the rock level found in the lowest well record.[1] It is probable that this well is not situated where the rock is lowest, that is, it may be on one side of the old Still River channel.

[1]Well of J. Hornig, rear of Bottling Works, near foot of Tower Place, 35 ft. to rock, indicated at *a*, fig. 5. The well of Bartley & Clancey, 94 White Street, 70 ft. to rock, is also indicated at *b*, fig. 5.

The level obtained at No. 8 is from a hole drilled within 50 feet of the river. The drill struck rock at an elevation of 316 feet after passing through 69 feet of quicksand, gravel, and till. This is clearly not within the channel as it is quite impossible to reconcile the figure with that at D, less than a mile distant.

South of Jerusalem bridge at J, 150 feet from the river, a hole was bored through 95 feet of clay, sand, and gravel before striking rock at an elevation of 298 feet.

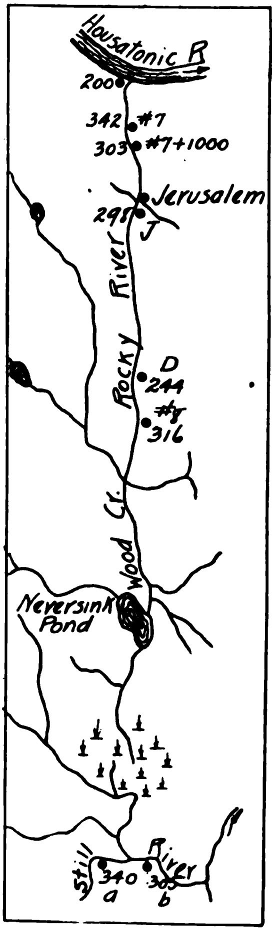

FIG. 5. Rocky River Valley. Diagram indicating lowest rock levels which have been discovered by drilling.

At the point marked No. 7+1000, about 1¼ miles from the mouth of Rocky River, the evidence derived from 8 drill holes, bored at distances ranging from 200 to 550 feet from the right bank, shows the drift cover to be from 48 to 72 feet in thickness. At 200 feet from the river the drill passed through 72 feet of sand, clay, and gravel before striking rock at 303 feet above sea-level.

At No. 7, about one mile from the mouth of Rocky River, a hole drilled 415 feet from the right bank showed 58 feet of drift, consisting of clay, sand, gravel, and boulders. The drill reached rock at 342 feet, which is the figure given by R. E. Dakin for the elevation of the river at this point. Drill holes made, respectively, at 50 and 60 feet to the right of this one showed a drift cover of 61 feet, so that the underlying rock rises only 4 feet in a distance of 475 feet to the east of the river.

The foregoing evidence, showing a rock level at D 98 feet lower than that at No. 7, leaves no doubt that the preglacial course of Rocky River was to the south from No. 7, and there is nothing in the topography between Jerusalem and Danbury to make improbable the existence of a buried channel.

EFFECT OF GLACIATION

The preglacial history of Rocky River as outlined assumes that before the glacier covered this part of Connecticut the present lower course of Rocky River was separated from the rest of the system by a divide situated somewhere between the present mouth of the river and the mouth of Wood Creek. It remains to be shown by what process Rocky River was cut off from its southern outlet into Still River and forced up its eastern branch and over the col into a tributary of the Housatonic. Though the preglacial course of Rocky River appears to be more natural than the present one, it is really a longer course to the Housatonic; the older route being 32 miles, whereas the present course is 19 miles. This fact explains, in part, why the glacier had little difficulty in altering the preglacial drainage, and how the change so effected became permanent. Eccentric as

the resulting system of drainage is, it would have been still more so had Rocky River when ponded overflowed at the head of its western instead of its eastern fork, taken its way past Sherman into the Housatonic near Gaylordsville, and discharging at this point lost the advantage of the fall of the Housatonic between Gaylordsville and Boardman.

In glaciated regions an area of swamp land may be taken as an indication of interference by the glacier with the natural run-off. The swamp in which Wood Creek joins the upper fork of Rocky River (fig. 1), was formerly a lake due to a dam built across the lower end of a river valley. Although the ponded water extended only a short distance up the steeper side valleys, it extended several miles up the main stream. The whole area of this glacial lake, except two small ponds and the narrow channels through which the river now flows, has been converted into a peat-filled bog having a depth of from 8 to 45 feet.[1]

At the termination of the swampy area on the eastern branch of Rocky River no indication is found of a dam such as would be required for so extensive a ponding of the waters. Here the valley is very narrow, and though the river bed is encumbered with heavy boulders, rock outcrops are so numerous as to preclude the idea of a drift cover raising the water level. This is just the condition to be expected if Rocky River reached its present outlet by overtopping a low col at the head of its former eastern branch.

The southern end of the Neversink Pond valley is the only other place whose level is so low that drift deposits could have interfered with the Rocky River drainage. The moraine at the head of this valley, crossing the country some two miles north of the city of Danbury and binding together two prominent north-and-south ridges, was evidently the barrier which choked the Rocky River valley near its mouth and turned back the preglacial river.

When Rocky River was thus ponded its lowest outlet was found to be at the head of its eastern fork. Here the waters spilled over the old divide and took possession of the channel of

[1]Report of soundings made in 1907 by T. T. Giffen.

a small stream draining into the Housatonic. Accordingly Rocky River should be found cutting its bed where it crosses the former divide. It seems reasonable to regard the gorge half-way between Jerusalem bridge and Housatonic River as approximately the position of the preglacial divide and to consider the small flat area to the north of Jerusalem bridge as a flood plain on softer rock, worn down as low as the outcrops of more resistant rock occurring farther down the valley will permit. The reversal of the river may account for the sudden transition from a flat-bottomed valley to a rocky gorge; and for the abrupt change in the profile, bringing the steepest part of the river near its mouth. The increased volume of water flowing through the channel since glacial time has plainly cut down the bed of the ravine between Jerusalem and the river's mouth, but the channel is still far from being graded.

THE NEVERSINK-DANBURY VALLEY.

Between Neversink Pond and Danbury extends a deep rock valley, in places filled with drift. As has been shown, this valley was probably occupied in preglacial time by Rocky River, which then flowed southward. At its southern end is Still River, which flows through Danbury from west to east.

The most important tributary of the Still rises northwest of the city, just beyond the New York-Connecticut boundary line, and has two forks. The northern fork, which drains East Lake, Padanaram Reservoir, and Margerie Pond, flows along the northeast side of Clapboard Ridge. The southern fork has two branches; the northern one includes the reservoirs of Upper Kohanza and Lake Kohanza, while the upper waters of the southern branch have been recently dammed to form an extensive reservoir. On approaching the city, the northernmost fork (draining East Lake) turns sharply out of its southeast course and flows in a direction a little east of north. At the end of Clapboard Ridge, the stream makes a detour around a knoll of coarse stratified drift. From this turn until it joins Still River, a distance of about a mile, the stream occupies a broad and partly swampy valley.

At the cemetery in this valley (fig. 1, C) are two eskers of symmetric form, each a few hundred yards in length and trending nearly parallel with the valley axis. East of the valley, and about 1½ miles north of the cemetery, is a broad, flat-topped ridge of till with rock exposed at the ends, forming a barrier which doubtless existed in preglacial time. West of the valley is a hill with rock foundation rounded out on the northeast side by a mass of drift. The preglacial course of Rocky River was between the outcrops at these two localities.

Northwest of the cemetery for one and a half miles the uneven surface is formed of till and small patches of stratified drift. In a swamp near the north end of the cemetery is a curved esker with lobes extending south and southwest. One mile north of this swamp is an area of excessively coarse till containing boulders which range in diameter from 6 to 10 feet and forming a low ridge separating two ravines, in which head streams flowing in opposite directions. The area of coarse till is bounded on the north by a long sinuous esker of coarse gravel terminating in a flat fan, which is superposed on a field of fine till. Associated with the esker is an interesting group of kames and kettleholes, the largest kettlehole being distinguished by distinct plant zones banding the sides of the depression.

North of the area of boulders, eskers, and kames just described lies a swamp whose surface is 30 to 40 feet below the upper level of the kame gravels. Soundings made by T. T. Giffen revealed the presence of 36 feet of peat and 2 feet of silt overlying firm sand, so that 70 feet is the minimum estimate for the difference in level between the surface of the gravels and the floor of the swamp.

Below the rocky cliffs which line the valley sides are boulders brought by the ice from near-by ledges, and about one-half mile above the head of the swamp are remnants of a terrace standing 20 to 30 feet above the level of the stream. Although the terrace appears to consist of till, it may conceal a rock floor which was cut by a former stream. As the valley is followed toward Neversink Pond, the various features of a till-coated, rock-floored valley are seen.

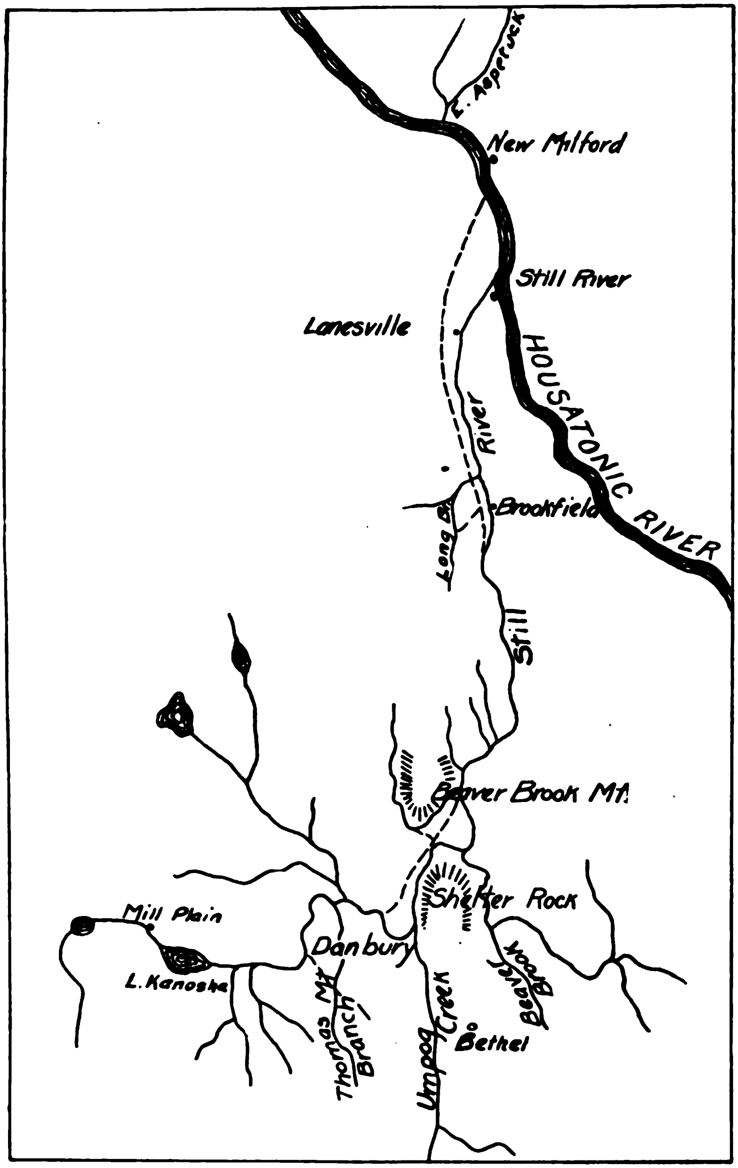

FIG. 6. Course of Still River. Dotted lines show the preglacial channels.

STILL RIVER

STATEMENT OF THE PROBLEM

Still River presents several unusual features, as shown in fig. 6. Tributaries from the west and south unite at Danbury to form a stream flowing northward opposite to the regional land slope. Near its junction with the Housatonic, the river flows northward, whereas its master stream half a mile distant flows southward. The lower valley of the river is broad and flat and apparently much out of proportion to the present stream; it is, indeed, comformable in size and direction with the valley of the Housatonic above the mouth of the Still. The Housatonic, however, instead of choosing the broad lowland in the limestone formation, spread invitingly before it, turns aside and flows through a narrow gorge cut in resistant gneiss, schist, and igneous intrusives. The headwaters of the Still mingle with those of the Croton system, and its chief southern branch, the Umpog, is interlaced with the sources of the Saugatuck on a divide marked by glacial drift and swamps. The explanation of these features involves not only the history of the Still River system, but also that of the Housatonic.

In explanation of the present unusual arrangement of streams in the Still River system, four hypotheses may be considered:

I. Still River valley is the ancient bed of the Housatonic from which that river has been diverted through reversal caused by a glacial dam.

II. The Housatonic has always had its present southeasterly course, but the Still, heading at some point in its valley north of Danbury, flowed initially southward through one of four possible outlets. The latter stream was later reversed by a glacial dam at the southern end, or by glacial scouring at the northern end of its valley which removed the divide between its headwaters and the Housatonic.

III. The Housatonic has always held its present southeasterly course, and the Still initially flowed southward, as stated above. Reversal in this case, however, occurred in a very early stage in the development of the drainage, as the result of the capture

of the headwaters of the Still by a small tributary of the Housatonic.

IV. The Housatonic has always held its present southeasterly course, but the Still has developed from the beginning as a subsequent stream in the direction in which it now flows.

The first hypothesis, that the Still is the ancient channel of the Housatonic, has been advocated by Professor Hobbs, who has stated:

"That the valley of the Still was formerly occupied by a large stream is probable from its wide valley area. . . The former discharge of the waters of the Housatonic through the Still into the Croton system, on the one hand, or into the Saugatuck on the other, would require the assumption of extremely slight changes only in the rock channels which now connect them. . . To turn the river (the Housatonic) from its course along the limestone valley some obstruction or differential uplift within the river basin may have been responsible. The former seems to be the more probable explanation in view of the large accumulations of drift material in the area south and west of Bethel and Danbury.

"The structural valleys believed to be present in the crystalline rocks of the uplands due to post-Newark deformation may well have directed the course of the Housatonic after it had once deserted the limestone . . The deep gorge of the Housatonic through which the river enters the uplands not only crosses the first high ridge of gneiss in the rectilinear direction of one of the fault series, but its precipitous walls show the presence of minor planes of dislocation, along which the bottom of the valley appears to have been depressed."[1]

The hypothesis proposed by Professor Hobbs and also the second and third hypotheses here given involve the supposition of reversal of drainage, and their validity rests on the probability that the stream now occuying Still River valley formerly flowed southward. The first and second hypotheses will be considered in the following section.

EVIDENCE TO BE EXPECTED IF STILL RIVER HAS BEEN REVERSED

If Still River occupies the valley of a reversed stream, the following physiographic features should be expected:

1. A valley with a continuous width corresponding to the size of the ancient stream, or a valley comparatively narrow at the north and broadening toward the south.

[1]Hobbs, W. H., Still rivers of western Connecticut: Bull. Geol. Soc. Am., vol. 13, pp. 17-26, 1901.

2. Tributary valleys pointing upstream with respect to the present river.

3. The regional slope not in accord with the present course of the river.

4. Extensive glacial filling and ponded waters in the region of the present sources of Still River.

5. Strong glacial scouring at the northern end in default of a glacial dam at the southern end of the valley, or to assist a dam in its work of reversing the river. The evidence of glacial erosion would be a U-shaped valley, overdeepening of the main valley, and tributaries ungraded with respect to the main stream.

1. A VALLEY WIDE THROUGHOUT OR BROADENING TOWARD THE SOUTH

At the mouth of Still River and for several miles north and south of it there is a plain more than a mile broad. This plain continues southward with a width of about one-half mile until, at Brookfield, it is interrupted by ledges of bare rock. A little distance south of Brookfield the valley broadens again to one-half mile, and this width is retained with some variation as far as Danbury. Drift deposits along the border of the valley make it appear narrower in some places than is indicated by rock outcrops. Between Brookfield and Danbury the narrowest place in the valley is southwest of Beaver Brook Mountain, where the distance between the hills of rock bounding the valley is one-fifth of a mile (fig. 6). Opposite Beaver Brook Mountain, which presents vertical faces of granite-gneiss toward the valley, is a hill of limestone. Ice, crowding through this narrow place in the valley, must have torn masses of rock from the side walls, so that the valley is now broader than in preglacial time. The constrictions in the valley near Shelter Rock are due to the fact that the preglacial valley, now partly buried in till, lies to the north. There are stretches of broad floor in the valley of Beaver Brook, in the lower valley of Umpog Creek, in the fields at the south end of Main Street in Danbury, about Lake Kanosha, and where the Danbury Fair Grounds are situated. In the western part of Danbury, however, and at Mill Plain the valley is very narrow, and at the head of Sugar Hollow, the valley lying east of Spruce Mountain, is a narrow col.

The broadest continuous area in the Still-Umpog Valley is, therefore, in the lower six miles between Brookfield and New Milford; south of that portion are several places where the valley is sharply constricted; and beyond the head of the Umpog, about one and a half miles below West Redding station (fig. 7), the Saugatuck Valley is a very narrow gorge. On the whole, the valleys south and southwest of Danbury are much narrower than the valley of the Still farther north. It is evident from these observations that Still River Valley is neither uniformly broad, nor does it increase in width toward the south.

But if a broad valley is to be accepted as evidence of the work of a large river, then there is too much evidence in the Still River valley. The broad areas named above are more or less isolated lowlands, some of them quite out of the main line of drainage, and can not be grouped to form a continuous valley. They can not be attributed to the Housatonic nor wholly to the work of the insignificant streams now draining them. These broad expanses are, in fact, local peneplains developed on areas of soluble limestone. The rock has dissolved and the plain so produced has been made more nearly level by a coating of peat and glacial sand. In a region of level and undisturbed strata, such as the Ohio or Mississippi Valley, a constant relation may exist between the size of a stream and the valley made by it; but in a region of complicated geologic structure, such as western Connecticut, where rocks differ widely in their resistance to erosion, the same result is not to be expected. In this region the valleys are commonly developed on limestone and their width is closely controlled by the width of the belt of limestone. Even the narrow valleys in the upland southwest of Danbury are to be accounted for by the presence of thin lenses of limestone embedded in gneiss and schist.

The opinion of Hobbs that Still River valley is too wide to be the work of the present stream takes into consideration only the broad places, but when the narrow places are considered it may be said as well that the valley is too narrow to be the work of a stream larger than the one now occupying it. Valley width has only negative value in interpreting the history of Still River.

2. TRIBUTARY VALLEYS POINTING UPSTREAM

The dominant topographic feature of western Connecticut, as may be seen on the atlas sheets, is elongated oval hills trending north by west to south by east, which is the direction of the axes of the folds into which the strata were thrown at the time their metamorphism took place. Furthermore, the direction of glacial movement in this part of New England was almost precisely that of foliation, and scouring by ice merely accentuated the dominant north-south trend of the valleys and ridges. As a result, the smaller streams developed on the softer rocks are generally parallel to each other and to the strike of the rocks. These streams commonly bend around the ends of the hills but do not cross them. The narrowness of the belts of soft rock makes it easy for the drainage of the valleys to be gathered by a single lengthwise stream. The Still and its larger tributaries conform in this way to the structure.

On the east side of the Still-Umpog every branch, except two rivulets 1¼ miles south of Bethel, points in the normal direction, that is, to the north, or downstream as the river now flows (fig. 6). The largest eastern tributary, Beaver Brook, is in a preglacial valley now converted into a swamp the location and size of which are due entirely to a belt of limestone. It is not impossible that Beaver Brook may have once flowed southward toward Bethel, but the limestone at its mouth, which lies at least 60 feet lower than that at its head, shows that if such were ever the case it must have been before the north-flowing Still River had removed the limestone north of Beaver Brook Swamp.

On the flanks of Beaver Brook Mountain are three tributaries which enter the river against its present course. Examination of the structure reveals, however, that these streams like those on the east side of the river are controlled in their direction by the orientation of the harder rock masses. The southward flowing stream four miles in length which drains the upland west of Beaver Brook Mountain has an abnormal direction in the upper part of its course, but on reaching the flood plain it takes a sharp turn to the north. Above the latter point it is in line with the streams near Beaver Brook Mountain and is abnormal in consequence of a line of weakness in the rock.

The lowland lying west of Umpog valley, extending from Main Street in Danbury to a point one mile beyond Bethel, affords no definite evidence in regard to the direction of tributaries. In reconstructing the history of this valley the chief difficulty arises from the old-age condition of the flood plain. Drainage channels which must once have existed have been obliterated, leaving a swampy plain which from end to end varies less than 20 feet in elevation. It is likely that in preglacial times the part of the valley north of Grassy Plain, if not the entire valley, drained northward into Still River, as now do Umpog Creek and Beaver Brook. From this outlet heavy drift deposits near the river later cut it off. The lowland is now drained by a stream which enters the Umpog north of Grassy Plain. Several small streams tributary to the Umpog south of Bethel also furnish no evidence in favor of the reversal of Still River.

West of Danbury the tributaries of Still River point upstream on one side and downstream on the other side of the valley, in conformity with the rock structure which is here diagonal to the limestone belt on which the river is located. Their direction in harmony with the trend of the rocks has, therefore, no significance in the earlier history of the river.

From the foregoing discussion, it appears that no definite conclusions in regard to the history of Still River can be drawn from the angle at which tributaries enter it. The direction of the branches which enter at an abnormal angle can be explained without assuming a reversal of the main stream, and likewise many of the tributaries with normal trends seem to have adopted their courses without regard to the direction of Still River.

3. REGIONAL SLOPE NOT IN ACCORD WITH COURSE OF THE STILL

Although the regional slope of western Connecticut as a whole is contrary to that of Still River, there is no marked lowering of the hill summits between the source of the river and its mouth. As branches on the south side of the Housatonic are naturally to be expected, there is nothing unusual in the Still flowing in opposition to the regional slope, except that it flows toward the north instead of the northeast.

4. EVIDENCE OF GLACIAL FILLING AND DEGRADING OF THE RIVER BED

Hobbs has suggested that the waters of the Housatonic may have been ponded at a point near West Redding until they rose high enough to overflow into the "fault gorge" below Still River Station, thus giving the streams of the Danbury region an outlet to the Sound by this route. This hypothesis calls for a glacial dam which has not been found. It is true there are glacial deposits in the Umpog valley south of Bethel. The Umpog flows as it does, however, not because of a glacial "dam" but in spite of it. The river heads on rock beyond and above the glacial deposits and picks its way through them (fig. 7). Drift forms the divide at the western end of Still River valley beyond Mill Plain, but the ponded water which it caused did not extend as far as Danbury (see discussion of Still-Croton valley). The Sugar Hollow pass is also filled with a heavy mantle of drift, but the valley is both too high and too narrow at the col to have been the outlet of the Housatonic.

It might be assumed that just previous to the advent of the ice sheet Still River headed south of its present mouth and flowed southward. In this case the Still, when reversed, should have overflowed at the lowest point on the divide between it and the Housatonic. It should have deepened its channel over the former divide, and the result would have been a gorge if the divide were high, or at least some evidence of river cutting even if the divide were low. On the contrary, Still River joins the Housatonic in a low, broad, and poorly drained plain.

The existing relief is due to the uneven distribution of drift. The river is now cutting a gorge at Lanesville, but the appearance of the valley to the west indicates that glacial deposits forced the river out of its former bed (fig. 6) and that no barrier lay between the preglacial Still River valley and the Housatonic Valley.

5. GLACIAL SCOURING

A reversal of Still River may be explained by glacial scouring which caused the northern end of the valley to become lower than the present divides at West Redding and Mill Plain. The evidence of such scour should be an overdeepened, U-shaped main valley and ungraded tributaries.

The northern part of Still River valley has not the typical U form which results from glacial erosion. As contrasted with the U-shaped glacial valley and the V-shaped valley of normal stream erosion, it might be called rectangular so sharply does the flat valley floor terminate against the steep hillsides. The floor is too smooth and flat and the tributary valleys too closely adjusted to the variant hardness of the rocks to be the work of such a rough instrument as the glacier. A level so nearly perfect as that of the flood plain is the natural result of erosion of soft rock down to a baselevel, whereas glacial scouring tends to produce a surface with low rounded hills and hollows.

Overdeepening would be expected, because glaciers erode without reference to existing baselevels. That a river valley should be cut out by ice just enough to leave it graded with respect to the main valley would be an unusual coincidence. This is what is found where the Still River valley joins the Housatonic, and it indicates normal stream erosion. Also, if the limestone of the northern Still River valley were gouged out by the glacier, the action would in all probability have been continuous in the limestone belt to the north of the Housatonic, and where the belt of soft rock crosses the Housatonic the river bed would be overdeepened. Although the valley of the Housatonic near New Milford is very flat, as is natural where a river crosses a belt of weak rock, the outcrops are sufficiently numerous to show that it has not been overdeepened. The limestone area along the East Aspetuck is largely overlain by till, but here again the presence of rock in place shows that the valley has not been overdeepened. Moreover, limestone boulders in the southern part of Still River valley are not as abundant as they should be under the hypothesis that the northern part had been gouged out extensively.

That the northern part of the Still River valley was not deeply carved by ice is shown also by the character of the tributary streams. The three small brooks on the west side of the valley, near Beaver Brook Mountain, were examined to see if their grades indicated an over-deepening of the main valley. These streams, however, and others so far as could be determined, were found to have normal profiles; that is, their grades become increasingly flatter toward their mouths. The streams are cut-

ting through the till cover and are not building alluvial cones where they join the lowland. All their features, in fact, are characteristic of normal stream development.

Throughout the length of the valley, rock outcrops are found near the surface, showing that the changes produced by the glacier were due to scouring rather than to the accumulation of glacial material. Except where stratified drift is collected locally in considerable quantity, the glacial mantle is thin. On the other hand, it has been shown that glacial gouging was not sufficient in amount to affect the course of the stream. The glacier simply cleaned off the soil and rotten rock from the surface, slackening the stream here and hastening it there, and by blocking the course with drift it forced the river at several places to depart slightly from its preglacial course.

The evidence shows, therefore, that if Still River has suffered reversal, glaciation is not responsible for the change, and thus the first two hypotheses for explaining the history of the valley are eliminated. There remain for discussion the third and fourth hypotheses; the former being that reversal was effected in a very early stage in the development of the drainage, the latter that no reversal has occurred. The choice between these two hypotheses rests on evidence obtained in the Umpog, Croton, and other valleys of the Danbury region. This evidence is presented in the three following sections, after which the former courses of Still River will be discussed.

THE STILL-SAUGATUCK DIVIDE

FEATURES OF THE UMPOG VALLEY

The valley of the Umpog, which extends from Still River to the source of the Saugatuck near West Redding (fig. 7), is a critical area in the study of the Still River system. It is possible that this valley once afforded an outlet for Still River, and it has been suggested that the Housatonic formerly followed this route to Long Island Sound. The relation of this valley to the former drainage system of the Danbury region demands, therefore, a careful examination of the features of the valleys occupied by Umpog Creek and the upper waters of the Saugatuck, and of the divide between those streams.

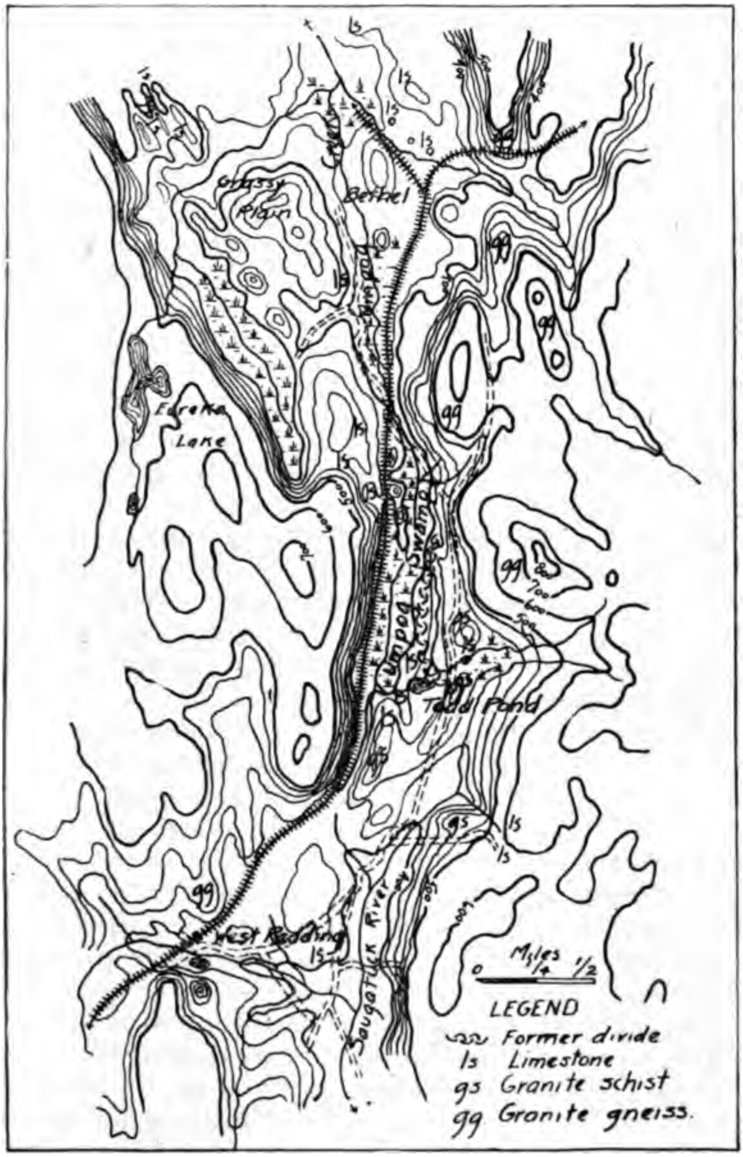

FIG. 7. Map of Umpog Swamp and vicinity.

North of Bethel the Umpog occupies an open valley developed in limestone. Knolls of limestone rise to heights of about 40 feet above the floor of the valley and their upper surfaces are cut across the highly tilted beds. This truncation, together with a general correspondence in height, suggests that these knolls, as well as the rock terraces found between Bethel and West Redding, and the limestone ridge which forms the divide itself, are portions of what was once a more continuous terrace produced by stream erosion and that they determine a former river level. The absence of accurate elevations and the probability of glacial scour make conclusions regarding the direction of slope of this dissected rock terrace somewhat uncertain. As will be indicated later, however, it seems likely that these terrace remnants mark the course of a southward flowing river that existed in a very early stage in the development of the drainage.

South of Bethel the old Umpog valley has lost from one-third to one-half its width through deposits of stratified drift (Pl. II, A and B). On the west, gravel beds lie against rock and till; on the east, deposits of sand and coarse gravel form a bench or terrace from 500 to 700 feet broad, which after following the side of the valley for one-half mile, crosses it diagonally and joins the western slope as a row of rounded hills. Through this drift the present stream has cut a narrow channel.

The narrowest part of the Umpog valley is about one mile south of Bethel. Farther upstream the valley expands into the flat occupied by Umpog Swamp, which presents several interesting features. The eastern, southern, and western sides of the swamp are formed of irregular masses of limestone and granite-gneiss 20 to 60 feet high. Near the northwestern edge of the swamp is a terrace-like surface cut on limestone. Its elevation is about the same as that of the beveled rock remnants lying in Umpog valley north of Bethel.

Umpog Swamp was formerly a lake but is now nearly filled with organic matter so that only a small remnant of the old water body remains. Soundings have revealed no bottom at 43 feet[1] and the depth to rock bottom is not less than 45 feet. The swamp situated one-half mile southwest of Bethel has a depth to rock of 35 feet. In their relation to the Still River system

[1]Report by T. T. Giffen, 1907.

A. View up the valley of Umpog Creek. The valley dwindles in the distance to the "railroad divide." In the middle distance is Umpog Swamp; in the foreground the edge of of the southern end of row of Kames which points down the valley.

B. View down the valley of Umpog Creek. To the left is the edge of limestone terrace; in the middle distance is the Catholic cemetery situated on a terrace of stratified drift; on the right are mounds of stratified drift; in the distance is the granite ridge bounding the valley on the east.

these two swamps may be regarded simply as extensions of the Umpog Creek channel, but when the elevations of their bottoms are compared with that of points to the north and south, where the river flows on rock, it will be seen that a profile results which is entirely out of harmony with the present profile of the river. Thus Umpog Creek falls 40 feet at the point where it spills over the rock ledge into the swamp, and if the 45 feet which measures the depth of Umpog Swamp be added, the difference in level is seen to be at least 85 feet. A similar calculation locates the bottom of the smaller swamp near Bethel at an elevation of 340 feet above sea-level or on the same level as the bottom of Umpog Swamp. In a straight line 2¼ miles north of Bethel, Still River crosses rock at a level of 350 feet, or 10 feet higher than the bottom of Umpog Swamp. At Brookfield, 6½ miles north of the mouth of the Umpog, the Still crosses rock at 260 feet, and 4½ miles farther north, it joins the Housatonic on a rock floor 200 feet above sea-level (fig. 8, A). Such a profile can be ex-

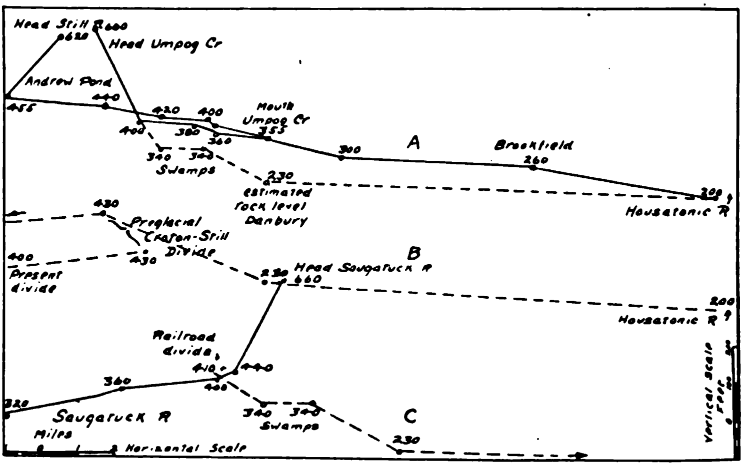

Fig. 8. Profiles of rivers. A. Profile of present Still River and buried channel of Umpog-Still River. B. Profile of preglacial Croton-Still River. C. Profile of preglacial Umpog-Still River. Solid lines show the present levels. Dotted lines show preglacial levels.

plained in either of two ways: glaciers gouged out rock basins in the weak limestone, or the river in its lower part has been

forced out of its graded bed onto rock at a higher level. Probably both causes have operated, but the latter has produced more marked effects.

Umpog Creek has its source in a small forked stream which rises in the granite hills east of the south end of Umpog Swamp. After passing westward through a flat swampy area, where it is joined by the waters from Todd Pond, the stream turns north and follows a shallow rock gorge until Umpog Swamp is reached. The divide which separates the present headwaters of the Umpog from those of the Saugatuck is a till-covered swampy flat about one-quarter mile east of Todd Pond. This arrangement of tributary streams is correctly shown in fig. 7 and differs essentially from that shown on the Danbury atlas sheet. This divide owes its position to the effects of glaciation. Deposits of till and the scouring of the bed rock so modified the preglacial surface that the upper part of the Saugatuck was cut off and made tributary to the Umpog.

THE PREGLACIAL DIVIDE

In order to determine whether Still River flowed southward through the Saugatuck Valley just before the advent of the ice sheet, the borders of Umpog Swamp and the region to the south and east were examined. It was found that Umpog Swamp is walled in on the south by ledges of firm crystalline limestone and that the rock-floored ravine leading southward from the swamp, and occupied by the railroad, lies at too high an elevation to have been the channel of a through-flowing stream. A south-flowing Still River, and much less an ancient Housatonic, could not have had its course through this ravine just previous to glaciation. A course for these rivers through the short valley which extends southeastward from Umpog Swamp is also ruled out, because the bedrock floor of this hypothetical passageway is 20 feet higher than the floor of the ravine through which the railroad passes.

The eastern border of Umpog Swamp is determined by a ridge of limestone which separates the swamp from lowlying land beyond. This ridge is continuous, except for the postglacial gorge cut by the tributary entering from the east, and must have been in existence in preglacial times. The entire lowland east

of this limestone ridge possesses a unity that is not in harmony with the present division of the drainage. The streams from this hillside and those from the west may have joined in the flat-floored valley at the head of the Saugatuck and from there flowed into the Saugatuck system. The former divide then lay in a line connecting the limestone rim of the swamp with the tongue of highland which the highway crosses south of Todd Pond (fig. 7).

THE STILL-CROTON DIVIDE

INTRODUCTION

The deep valley extending from the Danbury Fair Grounds to the East Branch Reservoir in the Croton River system, has given rise to the suggestion that the course of the Housatonic formerly may have been along the line of Still and Croton rivers and thence to the Hudson.[1] From the evidence of the topographic map alone, this hypothesis appears improbable. The trend of the larger streams in western Connecticut is to the south and southeast; a southwesterly course, therefore, would be out of harmony with the prevailing direction of drainage. Also, the distance from the present mouth of Still River to tide-water by the Still-Croton route is longer than the present route by way of the Housatonic.

FEATURES OF STILL RIVER VALLEY WEST OF DANBURY

From Danbury to its source Still River occupies a valley whose features are significant in the history of the drainage. Between Danbury and the Fair Grounds (fig. 1) the valley is a V-shaped ravine 1½ miles long, well proportioned to the small stream now occupying it but entirely too narrow for the channel of a large river. Along the valley are outcrops of schist, and granite rock is present on both sides of the valley for a distance of about one-quarter mile. Part of the valley is a mere cleft cut in the rock and is unglaciated. At the Danbury Fair Grounds the valley opens out into a marshy plain, through which the river meanders and receives two tributaries from the south. The plain, which extends beyond Lake Kanosha on the west, has a generally level surface but is diversified in places by mounds of stratified drift.

[1] Hobbs, W. H., Still rivers of western Connecticut: Bull. Geol. Soc. Am., vol. 13, p. 25, 1901.

Near the railroad a rock outcrop was found which gives a clue to the nature of the broad lowland. The rock consists mainly of schist, but on the side next the valley there is a facing of rotten limestone. This plain, like all the others in this region, is a local peneplain developed on soluble limestone. A better example could not be found to prove the fallacy of the saying that " a broad valley proves the existence of a large river." The plain is simply a local expansion of a valley which on each side is much narrower. No other river than the one flowing through it can have been responsible for the erosion, for the plain is enclosed by hills of gneiss and schist (Pl. III).

At Mill Plain the valley is crowded by ragged rock outcrops which jut into the lowland. Here the river occupies a ravine cut in till near the north side of the valley. West of Mill Plain station the valley is encumbered with ridges of stratified drift, interspersed with heavy accumulations of till. Near Andrew Pond the true width of the valley — one-eighth mile — is shown by rock outcrops on both the north and south slopes. The valley at this point gives no indication of narrowing toward the headwaters; in fact, it becomes broader toward the west.

Between Andrew Pond and Haines' Pond is the divide which separates the waters of the Still system from those of the Croton. It consists of a jumbled mass of morainal hills, seemingly of boulder clay, that rise from 50 to 60 feet above the level of the ponds. The divide is thus merely a local obstruction in what was formerly a through drainage channel.

THE STILL-CROTON VALLEY

It is evident that before the advent of the glacier a stream must have flowed through the Still-Croton valley past the present divide in order to have excavated the rock valley there found. The Housatonic could not have flowed west through this valley if it was as narrow and shallow as is indicated by known rock outcrops; the river could have flowed through it only in a deep narrow gorge which was later buried under drift, but the evidence at hand does not support this view.

It is most probable that this valley was made by the preglacial Croton River. This explanation demands no change in the direction of Still and Croton Rivers but calls for a divide at some point

Limestone Plain southwest of Danbury, in which are situated the Danbury Fair Grounds and Lake Kanosha.

east of the present one. From a divide between the Fair Grounds and Danbury, a small stream may be supposed to have flowed toward the east, joining the larger northern branch of the Still at a point near the middle of the city of Danbury. The stream flowing westward from this divide formed the headwaters of one branch of the Croton system.

The presence of till in a ravine can be used as a criterion for locating the site of a former divide, for where till is present in the bed of a stream the channel is of preglacial date. Where the river crosses a divide it should be cutting through rock, though till may be present on the valley slopes. Judged by this test, the old divide was situated either just east of the Fair Grounds plain or at the east end of the ravine described in the preceding topic. Of these two positions the one near the Fair Grounds seems the more likely (fig. 1), for at this place the river has excavated a recent channel with steep sides in gneissoid rock. The absence of the limestone at this point may be sufficient in itself to explain the location of the divide.

Exact measurements of the drift in the upper Still valley are needed in order to establish this hypothesis completely and to plot the old channel, but the position of the rock floor of the former channel extending westward from the Fair Grounds may be fixed approximately. The rock at the assumed divide now stands at 420 feet above sea-level and it is reasonable to assume that ten feet has been removed by glacial scouring and post-glacial erosion, making the original elevation 430 feet. The present divide between Andrew Pond and Haines' Pond has an elevation of 460, but the bedrock at this place is buried under 60 feet of drift, so that the valley floor lies at 400 feet. According to these estimates the stream which headed east of the Fair Grounds had a fall of 30 feet before reaching the site of the present Haines' Pond (fig. 8, B).

GLACIAL LAKE KÅNOSHA

When the Croton Branch was beheaded by drift choking up its valley west of Andrew Pond, the ponded waters rose to a height of from 20 to 30 feet and then overflowed the basin on the side toward Danbury. The outlet was established across the old divide, and as the gorge by which the water escaped was cut

down, the level of the ponded waters was lowered. At the same time, also, the lake was filled by debris washed into it from the surrounding slopes. Thus the present flat plain was formed and the old valley floor, a local peneplain developed on the limestone, was hidden.

DIVIDES IN THE HIGHLANDS SOUTH OF DANBURY

The mountain mass to the south and southwest of Danbury, including Town Hill and Spruce, Moses, and Thomas mountains, is traversed by a series of parallel gorges trending nearly north and south (fig. 2). About midway in each valley is a col, separating north and south-flowing streams. Two of the valleys, those between Spruce and Moses mountains, and Thomas Mountain and Town Hill, form fairly low and broad passes. They were examined to see whether either could have afforded a southerly outlet for Still River.

The rock composing the mountains is granite-gneiss and schist with an average strike of N 30° W, or very nearly in line with the trend of the valleys. The gneiss was found to be characteristic of the high ridges and schist to be more common in the valleys. No outcrops of limestone were found on the ridges, but at two or three localities limestone in place was found on low ground. From the facts observed it is evident that the stronger features of the relief are due to the presence of bodies of resistant rock, whereas the valleys are due to the presence of softer rock. The series of deep parallel valleys is attributed to the presence of limestone rather than schist.

The gorge between Spruce and Moses mountains, locally called " Sugar Hollow," narrows southward as it rises to the col, and the rock floor is buried under till and stratified drift to depths of 25 to 50 feet. Nevertheless it is probable that the valley was no deeper in preglacial time than it is now. The plan of the valley with its broad mouth to the north favored glacial scour so that the ice widened and deepened the valley and gave it a U form. Scouring and filling are believed to have been about equal in amount, and the present height of the divide, about 470 feet, may be taken as the preglacial elevation. This is 70 feet higher than the rock floor of the divide at West Redding. The

pass could not, therefore, have served as an outlet for Still River.

The valley west of Town Hill is similar in form and origin to Sugar Hollow. The water parting occurs in a swamp, from each end of which a small brook flows. The height of the pass in this valley — 590 feet — precludes its use as an ancient outlet for Still River. Likewise the valley east of Town Hill affords no evidence of occupation by a southward through-flowing stream.

THE ANCIENT STILL RIVER

The conclusion that the Still-Umpog was not reversed by a glacial dam does not preclude the possibility that this valley has been occupied by a south-flowing stream. It is probable that in an early stage in the development of the drainage, the streams of the Danbury region reached Long Island Sound by way of the Still-Umpog-Saugatuck valley. Along this route, as described under the heading "The Still-Saugatuck Divide," is a fairly broad continuous valley at a higher level than the beds of the present rivers. A south-flowing river, as shown in fig. 9, brings all the drainage between Danbury and the Housatonic into normal relations.

This early relationship of the streams was disturbed by the reversal of the waters of the ancient Still in the natural development of a subsequent drainage. The Housatonic lowered the northern end of the limestone belt, in the region between New Milford and Stillriver village, faster than the smaller south-flowing stream was able to erode its bed. Eventually a small tributary of the Housatonic captured the headwaters of the south-flowing river, and by the time the latter had been reversed as far south as the present divide at Umpog Swamp, it is probable that the advantage gained by the more rapid erosion of the Housatonic was offset by the Saugatuck's shorter course to the sea. As a result the divide between Still and Saugatuck Rivers at Umpog Swamp had become practically stationary before the advent of the glacier.

The complex history of Still River is not fully shown in the stream profile, for the latter is nearly normal, except in the rock basins in the valley of the Umpog. This is due to the fact that changes in the course of the Still, caused by the development of

a subsequent drainage through differential erosion, were made so long ago that evidence of them has been largely destroyed.

The foregoing conclusion practically eliminates hypothesis IV — that the Still developed from the beginning as a subsequent stream in the direction in which it now flows. This hypothesis holds good only for the short portion of the lower course of the present river, that is, the part representing the short tributary of the Housatonic which captured and reversed the original Still.

DEPARTURES OF STILL RIVER FROM ITS PREGLACIAL CHANNEL

Between Danbury and Beaver Brook Mountain the Still departs widely from its former channel, as shown in fig. 6. At the foot of Liberty Street in Danbury the river makes a sharp turn to the southeast, flows through a flat plain, and for some distance follows the limestone valley of the Umpog, meeting the latter stream in a swampy meadow. It then cuts across the western end of Shelter Rock in a gorge-like valley not over 200 feet wide. Outcrops of a gneissoid schist on the valley sides and rapids in the stream bear witness to the youthfulness of this portion of the river channel.

An open valley which extends from the foot of Liberty Street in a northeasterly direction (the railroad follows it) marks the former course of Still River, but after the stream was forced out of this course and superimposed across the end of Shelter Rock by the accumulation of drift in the central and northern parts of the valley, it was unable to regain its old channel until near Beaver Brook Mountain. The deposits of drift not only have kept the Still confined to the eastern side of its valley but have forced a tributary from the west to flow along the edge of the valley for a mile before it joins its master stream.

About a mile north of Brookfield Junction, Still River valley begins to narrow, and at Brookfield the river, here crowded to the extreme eastern side, is cutting a gorge through limestone. The preglacial course of the Still in the Brookfield region seems to have been near the center of the valley where it was joined by Long Brook and other short, direct streams draining the hillsides. The glacier, however, left a thick blanket of drift in the middle

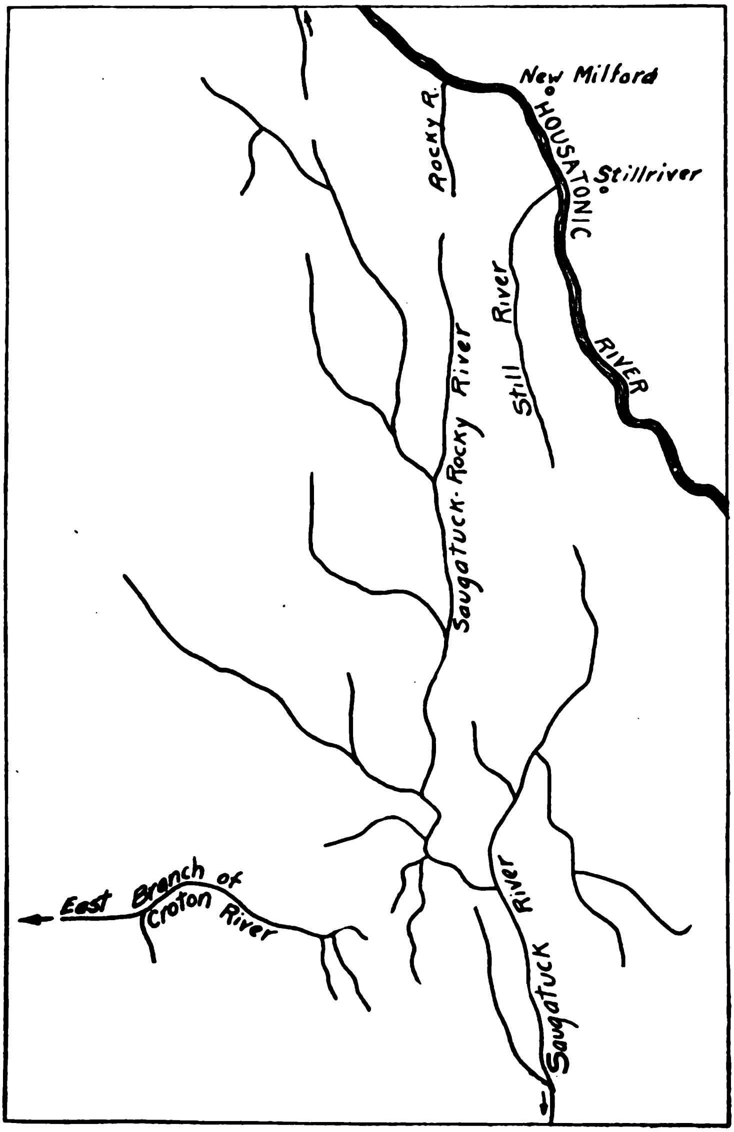

FIG. 9. **Early stage of the** Rocky-Still River, antedating preglacial course shown in figure 4.

of the valley which turned the Still to the east over rock and forced Long Brook to flow for more than a mile along the extreme western side of the valley.

The broad valley through which the Still flows in the lower part of its course extends northward beyond it for over two miles, bordering the Housatonic River. At Lanesville near the mouth of the Still, the river has cut a gorge 30 feet deep and one-quarter mile long in the limestone. Upstream from this gorge the river meanders widely in a flat valley, whereas on the down-stream side it has cut a deep channel in the drift in order to reach the level of the Housatonic. There is room in the drift-covered plain to the west for a buried channel of Still River which could join the Housatonic at any point between New Milford and Stillriver station. If the depth of the drift be taken at 25 feet, there would seem to be no objection to the supposition that the Still initially joined its master stream opposite New Milford, as shown in fig 6. After the limestone had been worn down to approximate baselevel, the tendency of the Still would have been to seek an outlet farther south in order to shorten its course and reach a lower level on the Housatonic. This stage in the evolution of the river may not have been reached before the ice age, and it is thus possible that glacial deposits may have pushed the river to the extreme southern side of its valley, superimposed it over rock, and forced it to cut its way down to grade.

SUGGESTED COURSES OF HOUSATONIC RIVER

As possible former outlets for the Housatonic, Hobbs has suggested the Still-Umpog-Saugatuck valley or the Still-Croton valley (by way of the East Branch Reservoir)[1], whereas Crosby has suggested the Ten Mile-Swamp River-Muddy Brook-Croton River valley (by way of Webatuck, Wing's Station, and Pawling), or the Fall's Village-Limerock-Sharon-Webatuck Creek-Ten Mile valley.[2] The sketch map, fig. 10, indicates the courses just outlined and one other by way of the Norwalk. The latter

[1] Hobbs, W. H., Still rivers of western Connecticut: Bull. Geol. Soc. Am., vol. 13, p. 25, 1901.

[2] Crosby, W. O., Notes on the geology of the sites of the proposed dams in the valleys of the Housatonic and Ten Mile rivers: Tech. Quart., vol. 13, p. 120, 1900.

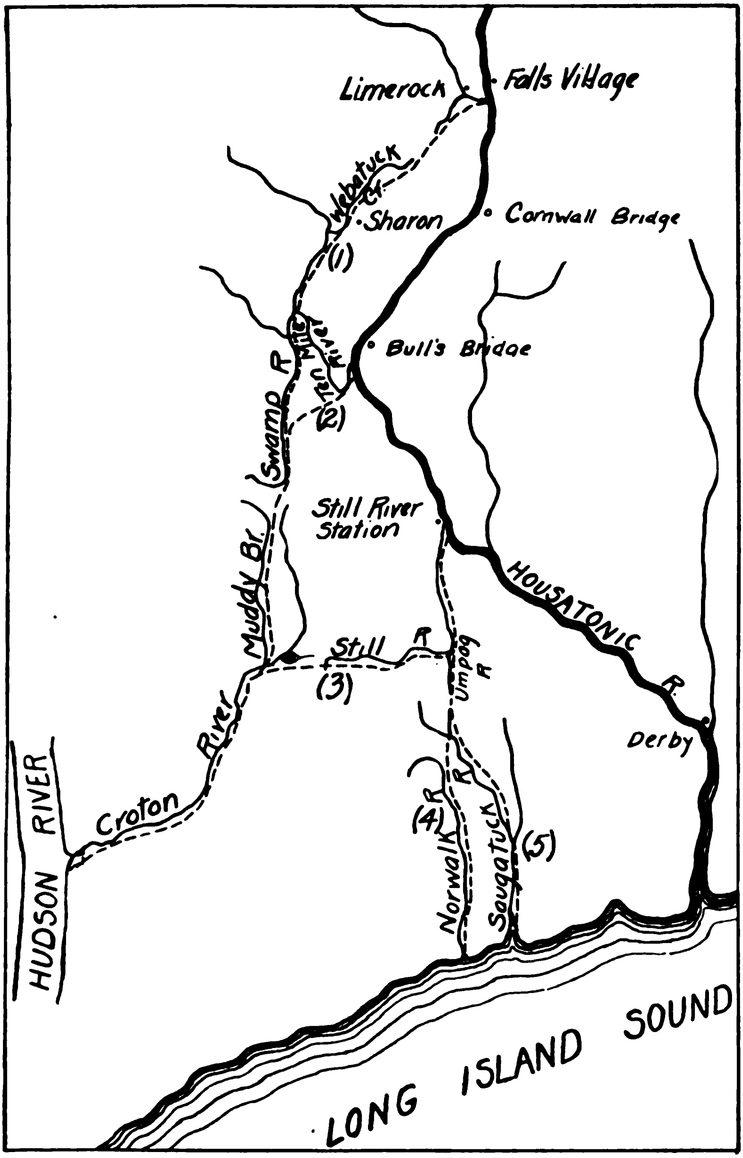

FIG. 10. Five suggested outlets of Housatonic River.

is the route followed by the Danbury and Norwalk Division of the Housatonic Railroad. It is natural to assume that the Housatonic might have occupied any one of these lines of valleys, particularly where they are developed on limestone and seem too broad for the streams now occupying them. Nevertheless, although each of these routes is on soft rock and some give shorter distances to the sea than the present course, it is highly improbable that the Housatonic ever occupied any of these valleys. For had the river once become located in a path of least resistance, such as is furnished by any of these suggested routes, it could not have been dislodged and forced to cut its way for 25 miles through a massive granitic formation, as it does between Still River and Derby, without great difficulty (Pl. IV, A).

An inspection of the larger river systems of Connecticut shows that the streams composing them exhibit two main trends. Likewise, the courses of the larger rivers themselves, whether trunk streams or tributaries, combine these two trends, one of which is northwest-southeast and the other nearly north-south.

The north-south drainage lines are the result of geologic structure, and many broad, flat-floored valleys, often apparently out of proportion to the streams occupying them, have this direction. On the other hand, the northwest-southeast drainage lines across the strike of formations, coincide with the slope toward the sea of the uplifted peneplain whose dissected surface is represented by the crests of the uplands. The valleys of streams with this trend are generally narrow, and some are gorges where resistant rock masses are crossed. The northwest-southeast trends of master streams thus were determined initially by the slope of the peneplain, whereas the north-south trends represent later adjustments to structure.

It is concluded, therefore, that the Housatonic between Bulls' Bridge and Derby (fig. 10), had its course determined by the slope of the uplifted peneplain and is antecedent in origin. The old headwaters extended northwest from the turn in the river near Bull's Bridge, whereas that part of the river above Bull's Bridge was initially a minor tributary. This tributary, because of its favorable situation, in time captured all the drainage of the extensive limestone belt to the north and then became part of the main stream. The lower Housatonic, therefore, has always

A. View down the Housatonic Valley from a point one-half mile below Still River station. Pumpkin Hill, a ridge of resistant schist and quartzite, stands on right. A small island lies in the river.

B. Part of the morainal ridge north of Danbury. Till capped by stratified drift one mile north of Shelter Rock.

maintained its ancient course diagonal to the strike of formations, and differential erosion, which reaches its maximum expression in limestone areas, is responsible for the impression that the Still River lowland and other valleys west of the Housatonic may once have been occupied by the latter stream.

GLACIAL DEPOSITS

BEAVER BROOK SWAMP

A broad belt of limestone extends along the eastern side of the granite ridge of Shelter Rock and in preglacial time formed a broad-bottomed valley whose master stream had reached old age. When the glacier came it hampered the drainage by scooping out the rock bottom of the valley in places and by dropping deposits at the mouth of Beaver Brook valley, thus forming Beaver Brook Swamp or "The Flat," as it is called (fig. 6).

Among the deposits at the southern end of Beaver Brook Swamp is considerable stratified drift in the form of smoothly rounded hills or kames, which are situated both on the border of the valley and in the swamp. Till containing medium-sized boulders of granodiorite-gneiss occurs along the road which borders the east side of the densely wooded swamp.

Along the northeastern border of the swamp is a flat-topped terrace of till, perhaps a lateral moraine, through which a small stream heading to the north has cut a V-shaped ravine. A lobe of fine till extends into the valley from the northeast and narrows the outlet.

Between the railroad and highway, which cross the northern end of the swamp, is an irregular wooded eminence of rock, partly concealed by a veneer of drift. Between this knoll and Shelter Rock are heavy deposits of sand in the form of a short, broad terrace with lobes which point into the Still River valley. A similar terrace is found to the northwest on the opposite side of the valley.

At the northern end of Shelter Rock along the blind road leading to the summit is a peninsula-like body of drift which contains huge granite boulders mixed here and there with pockets of sand and gravel. Stratified drift was found at the foot of the hill, and

till overlying it higher up. The more usual arrangement is boulder clay overlain by modified drift, the first being laid down by the ice itself, the second being deposited by streams from the melting glacier in its retreat. Huge boulders, many ten feet or more in diameter, are strewn over the northern slope of Shelter Rock.

DEPOSITS NORTHEAST OF DANBURY

North of the railroad, opposite Shelter Rock (fig. 6), is a most interesting flat-topped ridge of drift which topographically is an extension of the higher rock mass to the northwest. In this drift mass are to be found in miniature a number of the forms characteristic of glacial topography. The broad-topped gravel ridge slopes sharply on the north into a flat-bottomed ravine which is evidently part of the Still River lowland. This portion of the valley has been shut off by drift deposits. The drainage has been so obstructed that the stream in the ravine turns northeast away from its natural outlet. In the valley of "X" brook (fig. 1) are terraces, esker-like lobes, and detached mounds of stratified drift resting on a foundation of till.

Along the eastern border of the hill is to be seen the contact between two forms of glacial deposits (Pl. IV, B). A mass of stratified drift overlies a hummocky deposit of coarse till, but large boulders occurring here and there on top of the stratified drift show that the ice-laid and water-laid materials were not completely sorted. Boulders seem to have been dropping out of the ice at the same time that gravel was being deposited. Boulders of granite-gneiss eight feet or more in diameter, carried by the ice from the hills to the north and northeast, are strewn at the foot of the hill.

DEPOSITS BETWEEN BEAVER BROOK MOUNTAIN AND MOUTH OF STILL RIVER

About a mile beyond Beaver Brook Mountain, the railroad cuts through the edge of a hill 80 feet in height exposing a section consisting of distinctly stratified layers of fine white quartz sand, coarser yellowish sand, and small round pebbles. The quartz sand was used at one time in making glass. Farther east where

A. Kames in Still River Valley west of Brookfield Junction.

B. Till ridges on the western border of Still River Valley, south of Brookfield.

the two tracks of the New York and New England railroads converge, a cut shows a section of at least 40 feet of boulder clay. Near the river, limestone boulders are common, indicating that the valley to the north was degraded to some extent by the glacier.

In the valley at Brookfield Junction and on its western side, are thick deposits of clean sand. One mile north of Brookfield Junction, along the western border of the valley, an esker follows an irregular course for several hundred yards approximately parallel to the river and terminates at its southern end in a group of kames (Pl. V, A and B). Opposite the point where these accumulations occur, is a terrace-like deposit of till. Between the gorge at Brookfield and the mouth of Still River, swampy areas, flat meadows, and small hills of drift occur.

In comparison with the Still River lowland, the flat land east of Green Mountain may be called a plateau. The step between the two is made by an east-facing rocky slope, the outline of which has been softened by a lateral moraine separated from the plateau edge by a small ravine. On the lowland below the moraine is a group of kames. Near Lanesville (fig. 6), are thick deposits of water-laid material, including a hill of gravel near the river having a large bowl-shaped depression on one side formed by the melting of an ice block. Two and a half miles south of Lanesville on the west side of the lowland, a wooded esker extends for about one-quarter mile parallel to the valley axis and then merges into the rocky hillside.

LAKES

The lakes of this region are of two kinds: (1) those due to the damming of river valleys by glacial deposits and (2) rock basins gouged out by the ice.

Among the lakes which owe their origin to drift accumulations in the valleys are Andrew and Haines' ponds at the head of Still River. These are properly parts of the Croton River system, but Andrew Pond has been held back by the deep filling of boulder clay in the valley. Lake Kanosha, in the same valley, is a shallow lake formed in the drift. The lake south of Spruce Mountain at the head of the Saugatuck seems to be enclosed by drift alone.

Neversink Pond, Barses Pond, Creek Pond, and Leonard Pond are the remnants of larger water bodies now converted into swamps. Squantz Pond and Hatch Pond have dams of drift. Eureka Lake and East Lake appear to be rock basins whose levels have been raised somewhat by dams of till. Great Mountain Pond and Green's Pond, between Great Mountain and Green Mountain, are surrounded by rock and their level has been raised several feet by artificial dams. Great Mountain Pond is at least 50 feet above the level of Green Pond and separated from it by a rock ridge (fig. 2).

HISTORY OF THE GLACIAL DEPOSITS

A tongue of the glacier is supposed to have lain in the valley of the Umpog and gradually retreated northward after the ice had disappeared from the uplands on either side. The ridge of intermediate height built of limestone and schist, which extends down the middle of the valley, was probably covered by ice for some time after the glacier had left the highlands.

When the mountain mass extending from Pine Mountain to Town Hill west of the Umpog Basin and the granite hills to the east terminating in Shelter Rock are considered in their relation to the movement of the ice, it is apparent that the valley of the Umpog must have been the most direct and lowest outlet for glacial streams south of Danbury. These streams built up the terraces and other deposits of stratified drift which occupy the valley between Bethel and West Redding.

The heavy deposits of till near West Redding mark a halt in the retreating glacier. The boulders at this point are large and numerous, and kames and gravel ridges were formed. The deposits at the divide, supposed to have formed a glacial dam which reversed the Umpog,[1] are much less heavy than at points short distances north and south of the water parting.

As the ice retreated, sand and gravel in the form of terraces accumulated along the margin of the Umpog valley, where the drainage was concentrated in the spaces left by the melting of the ice lobe from the hillside. Among these deposits are the bodies of sand and gravel which lie against the rocky hillslopes most of

[1] Hobbs, W. H., op. cit.

the way from the Umpog-Saugatuck divide to Bethel. North of Bethel, the drainage seems to have been gathered chiefly in streams flowing on each side of the low ridge occupying the center of the valley; consequently the gravel was deposited along the sides and southern end of the ridge and in the sag which cuts across its northern end. The row of kames at the north end of Umpog Swamp, several knolls of drift in Bethel, and the kame-like deposits and esker north of Grassy Plain were laid down successively as the ice retreated down the valley. During this period, the drainage was ponded between the ice front and the Umpog-Saugatuck divide.

Uncovering the Still-Croton valley did not give the glacial drainage any lower outlet than the Umpog-Saugatuck divide afforded (fig. 8, B and C.)

The heavy deposits of boulder clay forming the moraine which blocks the Rocky River valley indicate the next halting place of the glacier. In this period the ice margin formed an irregular northeast-southwest line about a mile north of Danbury. The country west and south of Danbury was thus uncovered, but the lower part of Still River valley was either covered by the ice sheet or occupied by an ice lobe. The drainage was, therefore, up the river valley, and being concentrated along the valley sides resulted in the accumulation of sand and gravel at the foot of rocky slopes. It is possible that an ice lobe extended down the old Rocky River valley, perhaps occupying much of the country between Beaver Brook Mountain and the high ridge west of the valley. The streams issuing from this part of the ice front would have laid down the eskers and kame gravels north of Danbury and the thick mantle of drift over which Still River flows through the city. As would be expected, this accumulation of material ponded all the north-flowing streams — Umpog Creek, Beaver Brook, and smaller nameless ones — and at the same time pushed Still River, at its mouth, to the southern side of its valley. Beaver Brook valley, Umpog valley, and all the Danbury basin must have been flooded during this period up to the height of the "railroad divide." Within the area covered by the city, the valley was filled up to at least 70 feet and probably much more than that above its former level. Flowing at this higher level, the river was thrown out of its course and here and there

superimposed on hard rock — as, for example, at Shelter Rock.

That part of the drainage coming down the valley opposite Beaver Brook met the drainage from Still River ice lobe in the valley north of Shelter Rock, and as a result heavy deposits of stratified drift were laid down. The peninsula-like mass of drift beyond the river north of Shelter Rock appears from its form to have been built up as the delta of southward and eastward-flowing streams; probably the drainage from the hilltops united with streams coming down the two valleys. The lobes of stratified drift extending from the ridge may have been built first, and later the connecting ridge of gravel which forms the top of the hill may have accumulated as additional material was washed in, tying together the ridges of gravel along their western ends. The mingling in this region of stratified drift of all grades of coarseness indicates the union in the same basin of debris gathered from several sources.

Between Danbury and New Milford no moraine crosses either the Rocky or the Still valley, but the abundance of till which overspreads the whole country indicates a slowly retreating glacier well loaded with rock debris. The mounds of stratified drift scattered along the valley doubtless represent the deltas of streams issuing from the ice front. The waters of Rocky River were ponded until the outlet near Jerusalem was uncovered and the disappearance of ice from the ravine below allowed an escape to the Housatonic. Stratified drift is present in greatest amount along the valleys of Still River and the west fork of Rocky River, indicating that these were the two chief lines of drainage. The uplands are practically without stratified drift.

Along the valley of the Housatonic, glacial material is chiefly in the form of gravel terraces; they extend from Gaylordsville to New Milford, in some places on one side only, in others on both sides of the river. Part of these gravel benches are kame terraces, as shown by their rolling tops and the ravine which separates the terrace from the hillside; others may have been made by the river cutting through the mantle of drift which was laid down in the period of land depression at the time of glacial retreat,[1] or they may be a combination of the two forms. In

[1] Rice, W. N. and Gregory, H. E., Manual of the Geology of Connecticut: Conn. Geol. and Nat. Hist. Survey Bull. 6, pp. 34-35, 1906.

many places by swinging in its flood plain, the river has cut into the terraces and left steep bluffs of gravel. The valley of Womenshenuck Brook above Merwinsville contains heavy deposits of stratified drift, indicating that this broad valley which extends from Kent on the Housatonic to Merwinsville was an important channel for the water which flowed from the melting ice.

BULLETINS

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23. Central Connecticut in the Geologic Past: by Joseph Barrell.

24. Triassic Life of the Connecticut Valley: by Richard Swann Lull.

25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914.

26. The Arthrostraca of Connecticut: by Beverly Waugh Kunkel.

27. Seventh Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1915-1916.

28. Eighth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1917-1918.

29. The Quaternary Geology of the New Haven Region, Connecticut: by Freeman Ward, Ph.D.

30. Drainage, Modification and Glaciation in the Danbury Region, Connecticut: by Ruth Sawyer Harvey, Ph.D.

31. Check List of the Insects of Connecticut: by Wilton Everett Britton, Ph.D.

32. Ninth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1919-1920.

Bulletins 1, 9, 12, 17, 21, 25, 27, 28 and 32 are merely admin-ative reports containing no scientific matter. The other bulle-s may be classified as follows:

Geology: Bulletins 4, 6, 7, 8, 13, 18, 23, 24, 29, 30.

Botany: Bulletins 3, 5, 10, 11, 14, 15.

Zoölogy: Bulletins 2, 16, 19, 20, 22, 26, 31.

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9	.05	19	.45	29	.50
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It is intended to follow a liberal policy in gratuitously dis-outing these publications to public libraries, colleges, and

scientific institutions, and to scientific men, teachers, and others who require particular bulletins for their work, especially to those who are citizens of Connecticut.

Applications or inquiries should be addressed to

GEORGE S. GODARD,
State Librarian,
Hartford, Conn.

In addition to the bulletins above named, published by the State survey, attention is called to three publications of the United States Geological Survey prepared in co-operation with the Geological and Natural History Survey of Connecticut These are the following:

Bulletin 484. The Granites of Connecticut: by T. Nelson Dale and Herbert E. Gregory.

Water-Supply Paper 374. Ground Water in the Hartford, Stamford, Salisbury, Willimantic and Saybrook Areas, Connecticut: by Herbert E. Gregory and Arthur J. Ellis.

Water-Supply Paper 397. Ground Water in the Waterbury Area, Connecticut: by Arthur J. Ellis, under the direction of Herbert E. Gregory.

These papers may be obtained from the Director of the United States Geological Survey at Washington.

CATALOGUE SLIPS.

Connecticut. State geological and natural history survey.

Bulletin no. 31. Check-list of the insects of Connecticut. By Wilton Everett Britton. Hartford, 1920.

397 pp., 23^{cm}.

Britton, Wilton Everett.

Check-list of the insects of Connecticut. By Wilton Everett Britton. Hartford, 1920.

397 pp., 23^{cm}.

(Bulletin no. 31, Connecticut geological and natural history survey.)

CATALOGUE SLIPS.

Zoology.

Britton, W. E. Check-list of the insects of Connecticut. Hartford, 1920.

397 pp., 23cm.

(Bulletin no. 31, Connecticut geological and natural history survey.)

Insects.

Britton, W. E. Check-list of the insects of Connecticut. Hartford, 1920.

397 pp., 23cm.

(Bulletin no. 31, Connecticut geological and natural history survey.)

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State Geological and Natural History Survey

Publication Approved by the Board of Control

CHECK-LIST OF THE INSECTS OF CONNECTICUT

By
WILTON EVERETT BRITTON, Ph.D.
State Entomologist and
Entomologist of the Agricultural Experiment Station, New Haven, Conn.

HARTFORD
Printed for the State Geological and Natural History Survey
1920

CONTENTS

PREFACE.

The purpose of this list is to stimulate an interest in the collection and study of insects in the state, as has been done in New Jersey, and to serve as a check-catalogue of the species in the collections of the institutions and amateur collectors. A work entitled "Guide to the Insects of Connecticut," containing keys to orders, families, genera, and species, and including much information about life-histories, habits, distribution, etc., is already in progress: two papers, the Euplexoptera and Orthoptera, by B. H. Walden, and the Hymenoptera, by Henry L. Viereck, having already been published as Bulletins 16 and 22 of this Survey. It will be many years at least before the Guide can be finished so as to include all orders of insects, and the usefulness of a check-list for service during this time seemed to warrant its preparation and publication.

Only such species are included as are known to occur within the boundaries of the state, and are represented by specimens or reliable records. The list is based on the material in the collection of the Agricultural Experiment Station at New Haven, which has been accumulated during the past twenty years, and is now by far the most important collection of Connecticut insects in existence. Many records have been obtained from the collections of various institutions both in and outside of the state, and from many private collectors. No localities are mentioned in the list, but these will be given in the Guide. Where possible, one or more references are given for each species. These are not references to the original descriptions except in a few cases, but are usually references to the most accessible accounts, sometimes popular and sometimes scientific, containing descriptions, figures, or studies of life-histories and injuries that will aid one in recognizing the species. Only the well-known common names and

synonyms are given, except where a different specific or generic name occurs in the work cited.

The arrangement of the orders, families, and genera is from the lowest to the highest, and in this respect is opposite to that of Dyar's List of Lepidoptera and Blatchley's Coleoptera of Indiana, but coincides with Aldrich's List of Diptera and Calvert's List of Odonata. These works have all been followed except where they have been shown to be in error or where new or additional genera and species were included. For convenient reference the species have been arranged alphabetically.

I wish to acknowledge here my obligations to the following collectors and specialists for furnishing records and identifying species listed in this work.

W. D. Kearfott, Montclair, N. J.; the late Professor John B. Smith, Agricultural Experiment Station, New Brunswick, N. J.; William Beutenmüller and the late John A. Grossbeck, formerly of the American Museum of Natural History, New York, N. Y.; Charles W. Johnson, Boston Society of Natural History, Boston, Mass.; E. P. Van Duzee, Berkeley, Calif., formerly of Buffalo, N. Y.; George Dimmock, Springfield, Mass.; Professors Herbert Osborn and J. S. Hine, Ohio State University, Columbus, Ohio; Dr. E. P. Felt, State Entomologist, Albany, N. Y.; Doctors Philip L. Calvert and Henry Skinner, Philadelphia, Pa.; Professor J. G. Needham, Cornell University, Ithaca, N. Y.; Messrs. Charles W. Leng, John D. Sherman, Jr., Fred Wintersteiner, New York, N. Y.; J. R. de la Torre Bueno, White Plains, N. Y.; William T. Davis, New Brighton, Staten Island, N. Y.; Charles Schaeffer, Brooklyn, N. Y.; Professor W. E. Hinds, Auburn, Ala.; Kenyon F. Chamberlain, Cornwall, Conn.; Arthur I. Bourne, Amherst, Mass.; R. R. Parker, Bozeman, Mont.; J. F. Abbott, St. Louis, Mo.; Professor A. P. Morse, Wellesley College, Wellesley, Mass.; C. A. Frost, Framingham, Mass.; L. W. Swett, Boston, Mass.; Thomas L. Casey, Washington, D. C.; Professors J. W. Folsom and Alexander D. MacGillivray, University of Illinois, Urbana, Ill.; Dr. Edith M. Patch, Agricultural Experiment Station, Orono, Me.; Professors William Morton

Wheeler and Charles T. Brues, Bussey Institution, Forest Hills, Mass.; Charles R. Ely, Washington, D. C.; B. H. Walden, New Haven, Conn.; Dr. L. O. Howard, Dr. H. G. Dyar, the late Otto Heidemann, Henry L. Viereck, Nathan Banks, W. Dwight Pierce, S. A. Rohwer, of Washington, D. C., and John J. Davis, Riverton, N. J., Harrison E. Smith, Arlington, Mass., and Alfred B. Champlain, Harrisburg, Pa., all now or formerly of the Bureau of Entomology; and finally to many collectors whose initials appear after the names of species in the list.

This list must necessarily be very incomplete, but it is believed to be accurate and reliable in regard to the species included. It is hoped that sometime a revised and enlarged edition may be issued, and the author requests that authentic records be sent him of any additional species taken within the state.

W. E. BRITTON.

Agricultural Experiment Station,
New Haven, Conn., April 6, 1920.

STATISTICS.

Statistics of the insects listed in this Bulletin are as follows: —

Order	Number of Families	Number of Genera	Number of Species and Varieties
Thysanura	5	10	16
Isoptera	1	1	1
Corrodentia	1	6	9
Plecoptera	1	9	11
Ephemerida	1	7	11
Mallophaga	2	4	7
Neuroptera	5	10	16
Mecoptera	1	2	6
Trichoptera	7	17	30
Odonata	3	5	101
Euplexoptera	1	2	2
Orthoptera	6	50	106
Thysanoptera	3	9	12
Hemiptera	37	330	800
Lepidoptera	46	609	1452
Siphonaptera	1	1	1
Diptera	53	455	1111
Coleoptera	83	781	1825
Strepsiptera	2	3	3
Hymenoptera	74	635	1261
Total	333	2946	6781

KEY TO INITIALS OF AUTHORITIES FOR OCCURRENCE OF SPECIES.

A. B. C. — Alfred B. Champlain, Bureau of Economic Zoology, Harrisburg, Pa., formerly of Washington, D. C., Lyme and New Haven, Conn.

A. E. V. — Professor Addison E. Verrill, New Haven, Conn.

A. H. Me. — Rev. A. H. Manee, Southern Pines, N. C., formerly of New Milford, Conn.

A. H. Mn. — Dr. Anna H. Morgan, Mt. Holyoke College, South Hadley, Mass.

A. I. B. — Arthur I. Bourne, Amherst, Mass., formerly of New Haven, Conn.

Ald. Cat. — Aldrich's Catalogue of North American Diptera.

A. P. M. — Professor Albert P. Morse, Wellesley, Mass.

A. W. P. — A. W. Pearson, Norwich, Conn.

B. H. W. — B. H. Walden, New Haven, Conn.

C. C. — Rev. Charles Crozet, formerly of Hartford and Danielson, Conn., now of Rome, Italy.

C. D. J. — Professor C. D. Jarvis, formerly of Storrs, Conn.

C. H. Y. — Professor Clarence H. Young, New York City.

C. R. E. — Charles R. Ely, Washington, D. C. (Summers at East River, Conn.)

C. S. — Charles Schaeffer, Brooklyn, N. Y.

C. W. J. — Charles W. Johnson, Boston, Mass.

C. W. L. — Charles W. Leng, New York City.

D. J. C. — Donald J. Caffrey, Bureau of Entomology, Washington, D. C., formerly of New Haven and Wallingford, Conn.

D. W. C. — D. W. Coquillett, Washington, D. C. Died 1911.

E. D. H. — Edward Doubleday Harris, New York City. Died 1919.

E. F. — Ernst Frensch, Mystic, Conn.

E. L. D. — Edgar L. Dickerson, Newark, N. J.

E. N. — Edward Norton, Farmington, Conn. Died 1894.

E. P. F. — Dr. E. P. Felt, State Entomologist, Albany, N. Y.

E. P. V. D. — Edward P. Van Duzee, San Francisco, Calif., formerly of Buffalo, N. Y.

F. K. — Frederick Knab, Washington, D. C. Died 1918.
F. W. H. — F. W. Holms, Norwich, Conn.
G. A. C. — G. A. Cromie, New Haven, Conn.
G. D. — George Dimmock, Springfield, Mass.
G. H. H. — George H. Hollister, Hartford, Conn.
G. M. — Gustav Mayr, Vienna, Austria. Died 1908.
H. B. — Henry Bird, Rye, N. Y.
H. B. K. — Harry B. Kirk, Harrisburg, Pa., formerly of New Haven, Conn.
H. F. B. — Homer F. Bassett, Waterbury, Conn. Died 1902.
H. H. A. — H. H. Abeling, Torrington, Conn.
H. J. G. — Henry J. Goodman, New Haven, Conn.
H. L. J. — Harry L. Johnson, South Meriden, Conn.
H. L. V. — Henry L. Viereck, Bureau of Biological Survey, Washington, D. C., formerly of New Haven, Conn.
H. M. R. — H. M. Russell, Bureau of Entomology, Washington, D. C., formerly of Bridgeport, Conn. Died 1915.
H. W. F. — Professor H. W. Foote, New Haven, Conn.
H. W. W. — Rev. H. W. Winkley, formerly of Branford, Conn.
J. A. H. — James A. Hyslop, Bureau of Entomology, Washington, D. C.
J. K. L. — J. Kirby Lewis, New Haven, Conn.
J. R. T. B. — J. R. de la Torre Bueno, White Plains, N. Y.
J. S. H. — Professor J. S. Hine, Ohio State University, Columbus, Ohio.
J. T. K. — J. T. Klein, Torrington, Conn. Died 1904.
K. F. C. — Kenyon F. Chamberlain, Cornwall, Conn.
L. B. W. — Lewis B. Woodruff, New York City.
L. W. S. — L. W. Swett, Boston, Mass.
O. H. — Otto Heidemann, Bureau of Entomology, Washington, D. C. Died 1916.
P. L. B. — Philip L. Buttrick, New Haven, Conn.
R. H. — Robert Hochstein, Torrington, Conn. Died 1920.
R. Hd. — Roland Hayward, Milton, Mass. Died 1906.
S. I. S. — Professor Sidney I. Smith, New Haven, Conn.
S. N. D. — Stewart N. Dunning, Hartford, Conn.
S. W. W. — Professor S. W. Williston, Chicago, Ill., formerly of New Haven, Conn. Died 1918.

T. L. C. — Major Thomas L. Casey, Washington, D. C.
W. B. — William Beutenmüller, New York City.
W. C. W. — William C. Woods, Middletown, Conn.
W. E. B. — W. E. Britton, New Haven, Conn.
W. F. — William Fox, Philadelphia, Pa.
W. H. P. — William H. Patton, Hartford, Conn. Died, 1918.
W. M. W. — Professor William M. Wheeler, Forest Hills, Mass.
W. S. B. — Professor W. S. Blatchley, Indianapolis, Ind.

KEY TO REFERENCES CITED IN THIS LIST.

Act. Soc. Sci. Fenn. — Acta Societatis Scientiarum Fennicæ, Helsingfors, Finland.

Am. Ent. — American Entomologist, 1868. St. Louis, Mo. ii volumes; American Entomologist and Botanist, 1870. 2nd ser. i volume, 1880. New York, N. Y.

Am. Jour. Sci. — American Journal of Science and Arts. New Haven, Conn. 1818 — date.

Am. Mus. Jour. — Journal of the American Museum of Natural History. New York, N. Y.

Am. Nat. — The American Naturalist. Now published at New York, N. Y. Begun in 1867.

Annales — A series of papers on Diptera by Jacques Bigot in Annales de la Société Entomologique de France, Paris. 1874-1892.

Ann. Ent. Soc. Am. — Annals of the Entomological Society of America. Columbus, Ohio. 1908-date.

Ann. Lyc. Nat. Hist. N. Y. — Annals of the Lyceum of Natural History of New York, N. Y. 8 vols. 1824-1867.

Ann. Mus. Nat. Hung. — Annals of the National Museum of Hungary.

Ann. N. Y. Acad. Sci. — Annals of the New York Academy of Science. New York, N. Y. Begun in 1877.

Ann. Soc. Ent. France. — Annales de la Société Entomologique de Françe. Paris. Begun in 1832.

Aphid. Minn. — Synopsis of the Aphididæ of Minnesota, by O. W. Œstlund, Bulletin 4, Geological and Natural History Survey of Minnesota. St. Paul, Minn. 1887.

Berl. Ent. Zeit. or Zeitschr. — Berliner Entomologische Zeitschrift. Berlin, Germany. Begun in 1857.

Bomb. Moths. — A Monograph of the Bombicine Moths of America North of Mexico, by A. S. Packard, Memoirs, National Academy of Sciences, Vol. vii, Part 1. Notodontidæ. Washington, D. C. 1895.

Bost. Jour. Nat. Hist. — Boston Journal of Natural History. Boston, Mass. 1834-1863.

British Aphid. — Monograph of the British Aphides, by G. B. Buckton. 4 vols. Ray Society. London, England. 1875-1883.

Brit. Ent. — British Entomology, by J. Curtis. London, England.

Bull. Am. Mus. Nat. Hist. — Bulletin of the American Museum of Natural History. New York, N. Y. Begun in 1881.

Bull. Brook. Ent. Soc. — Bulletin of the Brooklyn (N. Y.) Entomological Society. 7 vols. 1878-1885. Re-established in 1912.

Bull. Buff. Soc. Nat. Sci. — Bulletin of the Buffalo Society of Natural Sciences. Buffalo, N. Y. Begun in 1874.

Bull. Geol. Geog. Surv. Terr. — Bulletin of the United States Geological and Geographical Survey of the Territories. Washington, D. C.

Bull. Ill. State Lab. Nat. Hist. — Bulletin of the Illinois State Laboratory of Natural History. Urbana, Ill.

Bull. Mosc. — Bulletin de la Société Impériale des Naturalistes de Moscow, Moscow, Russia.

Bull. Sci. Lab. Denison Univ. — Bulletin of the Science Laboratories, Denison University. Granville, Ohio.

Bull. Soc. Ent. Belg. — Bulletin de la Société Entomologique de Belgique. Brussels, Belgium. Begun in 1860.

Bull. Wis. Acad. Sci. — Bulletin Wisconsin Academy of Sciences, Milwaukee, Wis. Begun in 1901.

Bur. Ent. — Bureau of Entomology (formerly Division), United States Department of Agriculture, Washington, D. C. Bulletins, new series. Technical series, Circulars.

Butterfly Book. — The Butterfly Book, by W. J. Holland. Doubleday, Page & Co., Garden City, N. Y.

Can. Bark Beetles. — Canadian Bark Beetles, by J. M. Swaine. Technical Bulletin, No. 14, Entomological Branch, Department of Agriculture, Dominion of Canada, Ottawa, Can. 1918.

Can. Ent. — Canadian Entomologist. London, Ontario, Canada. Begun in 1869.

Cat. Brit. Mus. — Catalogue of the British Museum, London, England.

Cat. Brit. Tin. — Catalogue of British Tineinæ.

Cat. Homop. N. Y. — Catalogue of New York Homoptera.

Cat. Ins. N. Y. — Catalogue of New York Insects, by Asa Fitch. Fourth Annual Report of the Regents of the University of the State of New York, 1851. Reprinted in 9th Report of the N. Y. State Entomologist, 1892.

Cat. Lep. Eur. — Catalogue Méthodique des Lépidoptères d'Europe, by P. A. J. Duponchel. Paris, France. 1844-1846.

Cat. Noc. — Catalogue of Noctuidæ, by J. B. Smith. Bulletin 44. United States National Museum. Washington, D. C. 1893.

Cent. — Diptera Americæ Septentrionalis Indigena, by H. Loew. Originally published in 10 Centuries in Berliner Entomologische Zeitschrift, 1861-72. Berlin, Germany. (Usually cited as "Century.")

Cin. Quart. Jour. Sci. — Cincinnati Quarterly Journal of Science. Cincinnati, Ohio.

Coleop. Can. — Petite Faune Entomologique du Canada: Les Coleoptères, by L'Abbé L. Provancher, with two supplements. Quebec, Canada. 1877 and 1879.

Coleop. Ind. — Coleoptera of Indiana, by W. S. Blatchley. Nature Publishing Company, Indianapolis, Ind.

Collem. Minn. — Collembola of Minnesota, by Joseph E. Guthrie, Zoological Series IV, Geological and Natural History Survey of Minnesota.

Compl. Writ. — Complete Writings on the Entomology of North America, by Thomas Say. 2 vols.

Comst. Butt. — How to Know the Butterflies, by J. H. and A. B. Comstock. D. Appleton & Co., New York, N. Y.

Conn. Geol. Nat. Hist. Surv. — Connecticut Geological and Natural History Survey. Hartford, Conn. Begun in 1903.

Cornell Agr. Expt. Sta. — Cornell Agricultural Experiment Station. Ithaca, N. Y.

Diag. N. A. Phyc. — Diagnoses of North American Phycitidæ and Galleriidæ, by E. L. Ragonot. Paris, France. 1888.

Dipt. Exot. (Suppl.) — Diptères Exotiques Nouveaux ou Peu Connus, by J. Macquart. 2 vols. 5 supplements. 1838-1855. Paris, France.

Dipt. Saund. — Insecta Saundersiana, Diptera, by Francis Walker. 5 parts, London, England. 1850-1856.

Dipt. Scand. — Diptera Scandinaviæ, by J. W. Zetterstedt. London, England. 1842-1860.

Encycl. Meth. — Encyclopédie Méthodique, by A. G. Olivier. 1789-1791 et 1825. Paris, France.

Ent. Am. — Entomologica Americana. Brooklyn Entomological Society, Brooklyn, N. Y. 1885-1890.

Ent. Cont. — Entomological Contributions, by J. A. Lintner. N. Y. State Museum of Natural History, Albany, N. Y.

Ent. Monthl. Mag. — The Entomologists' Monthly Magazine. London, England. Begun in 1864.

Ent. News. — Entomological News. Philadelphia, Pa. Begun in 1892.

Ent. Rec. — Entomologists' Record and Journal of Variation. London, England. Begun in 1890.

Ent. Syst. Suppl. — Entomologia Systematica. Supplement, by J. C. Fabricius.

Enum. Hemip. — Enumeratio Hemipterorum, by C. Stål, Stockholm, Sweden, 1870-1876.

Exot. Schmett. — Lepidopterorum Exoticorum Species Novæ aut Minus Cognitæ, by G. A. W. Herrich-Schæffer. Ratisbonæ. 1850-1858.

Fauna Aust. — Fauna Austriaca (Diptera), by J. R. Schiner. 2 vols. Vienna, Austria. 1862-1864.

Faun. Bor. Am. — Fauna Boreali-Americana, by William Kirby. 4 vols. London, England. 1829-1837.

Faun. Germ. — Faunæ Insectorum Germanicæ Initia.

Gen. Ins. — Genera Insectorum. Fascicles 1-163. Edited by P. Wytsman. Brussels, Belgium. Begun in 1902.

Geol. Geog. Surv. — Bulletin of the United States Geological and Geographical Survey of the Territories. Washington, D. C.

Handb. Brit. Lep. — Handbook of British Lepidoptera, by E. Meyrick. London, England and New York, N. Y. 1895.

Hayden's Geol. Surv. Mont. — Hayden's Geological Survey of Montana. Washington, D. C.

Hemip. Col. — A Preliminary List of the Hemiptera of Colorado, by C. P. Gillette and C. F. Baker. Colorado Agricultural Experiment Station, Bull. 31 (Technical series No. 1), Fort Collins, Col. 1895.

Hemip. Gymn. Eur. — Hemiptera Gymnocerata Europæ, by O. M. Reuter. 5 vols. Helsingfors, Finland. 1878-1896.

Icon. Reg. An. Ins. — Iconographie du Règne Animal. Insectes. vii, by F. E. Guérin-Méneville. Paris, France. 1829-1844.

Ill. Exot. Ent. — Illustrations of Exotic Entomology, by Drury, London, England. 1770-1775.

Ill. Lep. Het. Brit. Mus. — Illustrations of Typical Specimens of Lepidoptera Heterocera in the Collection of the British Museum, London, England. 1877-1893.

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Insect Book. — The Insect Book, by L. O. Howard, Doubleday, Page & Co., Garden City, N. Y. 1901.

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Ins. Life. — Insect Life. 7 vols. U. S. Department of Agriculture, Washington, D. C. 1888-1894.

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Insec. Insc. Menst. — Insecutor Inscitiæ Menstruus. Washington, D. C. Begun in 1913.

Insects and Insecticides. — Insects and Insecticides, by C. M. Weed. Hanover, N. H. 1891.

Isis. — Encyclopädische Zeitschrift, Herausgegeben von Oken, Leipzig, Germany. 1817-1848.

Jour. Acad. Nat. Sci. — Journal of the Academy of Natural Sciences, Philadelphia, Pa.

Jour. Cin. Soc. Nat. Hist. — Journal Cincinnati (Ohio) Society of Natural History.

Jour. Econ. Ent. — Journal of Economic Entomology. Concord, N. H. Begun in 1908.

Jour. Ent. Zool. — Journal of Entomology and Zoology, Pomona College. Begun in 1909 as Pomona College Journal of Entomology, Claremont, Calif.

Jour. N. Y. Ent. Soc. — Journal of the New York Entomological Society. New York, N. Y. Begun in 1893.

Kans. Acad. Sci. — Transactions of the Kansas Academy of Sciences. Topeka, Kans. Begun in 1874.

Kans. Univ. Quart. — Kansas University Quarterly. Lawrence, Kans.

La. Agr. Expt. Sta. — Louisiana Agricultural Experiment Station. Baton Rouge, La.

Lep. Brit. — Lepidoptera Brittanica, by A. H. Haworth, London, England. 1803-1812.

Lep. Het. Brit. Mus. — Lepidoptera Heterocera of British Museum, London, England.

Lep. Ins. Ga. — The Natural History of the Rarer Lepidopterous Insects of Georgia, by J. E. Smith and J. Abbott. London, England. 1797.

Life Hist. Am. Insects. — Life History of American Insects, by Clarence Moores Weed. The MacMillan Company, New York, N. Y. 1901.

Linn. Ent. — Linnæa Entomologica. Berlin, Germany. 1846-1866.

List. — A List of the Specimens of Insects in the Collection of the British Museum, by Francis Walker. Diptera. 4 parts and 3 supplements. 1848-1855. Lepidoptera Heterocera i-xxxv, 1854-1866. London, England.

Mass. Agr. Expt. Sta. — Massachusetts Agricultural Experiment Station. Amherst, Mass.

Me. Agr. Expt. Sta. — Maine Agricultural Experiment Station. Orono, Maine.

Mem. Coleop. — Memoirs on the Coleoptera, by Thomas L. Casey, New Era Printing Co., Lancaster, Pa. Begun in 1910.

Mem. Ins. — Memoires pour Servir à L'Histoire des Insectes, by Charles DeGeer. 7 vols. Stockholm, Sweden. 1752-1758.

Mich. Agr. Expt. Sta. — Michigan Agricultural Experiment Station. East Lansing, Mich.

Minn. Agr. Expt. Sta. — Minnesota Agricultural Experiment Station. St. Anthony Park, Minn.

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N. J. Agr. Expt. Sta. — New Jersey Agricultural Experiment Station, New Brunswick, N. J.

N. Y. Agr. Expt. Sta. — New York Agricultural Experiment Station, Geneva, N. Y.

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Ofv. Finsk. Vet. Soc. Főrh. — Öfversigt af Finska Vetenskaps-Societetens Főrhandlingar-Helsingfors, Finland.

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Ohio Acad. Sci. — Ohio Academy of Sciences. Columbus, Ohio.

Ohio Nat. — Ohio Naturalist. Columbus, Ohio.

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Trans. Linn. Soc. London. — Transactions of the Linnean Society of London, England. Begun in 1791.

Trans. Md. Acad. — Transactions of the Maryland Academy of Science.

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Order **THYSANURA.**

Suborder **CINURA.**

Family MACHILIDÆ.

Machilis Latreille.

sp. probably **variabilis** Say. Pack. Guide, 9th Ed., pl. x, figs. 8 and 9.

Family LEPISMIDÆ.

Lepisma Linnæus.

quadriseriata Packard. *Ctenolepisma.* Bristle-tail. Silverfish. Fish moth. Pack. Guide, 9th Ed., 623.

saccharina Linnæus. Bristle-tail. Silverfish. Bur. Ent., Bull. 4, new ser., 76.

Thermobia Bergroth.

domestica Packard. *Lepisma.* Silverfish. Bristle-tail. Fish moth. Insect Book, 382; Bur. Ent., Bull. 4, new ser., 77.

Suborder **COLLEMBOLA.**

Family SMINTHURIDÆ.

Sminthurus Latreille.

hortensis Fitch. *pruinosus.* Garden flea. Rept. N. Y. State Ent., ii, 207.

Family ENTOMOBRYIDÆ.

Entomobrya Rondani.

sp.

Seira Lubbock.

nigromaculata Lubbock. Collem. Minn., 36.

Isotoma Bourlet.

albella Packard. Rept. Peab. Acad. Sci., v, 32.

sp. near **palustris** Müller. Collem. Minn., 70.

sp.

sp.

Family PODURIDÆ.

Achorutes Templeton.

armatus Nicolet. Proc. U. S. Nat. Mus., 50, 491.
harveyi Folsom. *Ibid.*, 50, 486.
nivicola Fitch. Rept. N. Y. State Ent., ii, 203.

Neanura MacGillivray.

muscorum Templeton. Proc. U. S. Nat. Mus., 50, 508.

Onychiurus Gervais.

fimetarius Linnæus. Proc. U. S. Nat. Mus., 53, 649.

Order **ISOPTERA.**

Family TERMITIDÆ.

Termes Linnæus.

flavipes Kollar. White ant. Bur. Ent., Bull. 4, new ser., 70.

Order **CORRODENTIA.**

Family PSOCIDÆ.

Troctes Burmeister.

divinatorius Müller. *Atropos.* Book louse. Bur. Ent., Bull. 4, new ser., 79.
pulsatorius Linnæus. *Clothilla.* Rept. N. Y. State. Ent., ii, 202.

Pterodela Kolbe.

pedicularis Linnæus. *Psocus salicis. Hemerobius.* Syn. Neurop. N. A., 13.

Cæcilius Curtis.

aurantiacus Hagen. *Psocus.* Syn. Neurop. N. A., 14.

Polypsocus Hagen.

corruptus Hagen. *Psocus.* Syn. Neurop. N. A., 13.

Psocus Latreille.

confraternus Banks. Trans. Am. Ent. Soc., xxxii, 2.
ieidyi Aaron. Proc. Acad. Nat. Sci., Phila., 1886, 15.
sp.

Cerastipsocus Kolbe.

venosus Burmeister. *Psocus.* Syn. Neurop. N. A., 10.

Order **PLECOPTERA.**

Family PERLIDÆ.

Acroneuria Pictet.

abnormis Newman. Syn. Neurop. N. A. 17.

Perla Geoffrey.

postica Walker. Syn. Neurop. N. A., 23.

Perlesta Banks.

placida Hagen. Syn. Neurop. N. A., 28.
virginica Banks. Trans. Am. Ent. Soc., xxv, 199.

Isoperla Banks.

bilineata Say. Syn. Neurop. N. A., 30.

Alloperla Banks.

imbecilla Say. Syn. Neurop. N. A., 31.
lateralis Banks. Trans. Am. Ent. Soc., xxxvii, 337.

Tæniopteryx Pictet.

frigida Hagen. Syn. Neurop. N. A., 35.

Nemoura Latreille.

perfecta Walker. Syn. Neurop. N. A. 37.

Leuctra Stephens.

tenella Provancher. N. Y. State Mus., Bull. 47, 416.

Capnia Pictet.

necydaloides Pictet. Syn. Neurop. N. A., 32.

Order **EPHEMERIDA.**

Family EPHEMERIDÆ.

Hexagenia Walsh.

bilineata Say. *Bætis*. Compl. Writ., i, 203. (A.H.Mn.)
limbata Pictet. *Bætis*. *Palingenia bilineata* Say. *variabilis* Eaton. Syn. Neurop. N. A., 41.

Ephemera Linnæus.

decora Walker. *varia* Eaton. Insect Book, pl. xxvi, 6.

Leptophlebia Westwood.

cupida Say. *Bætis ignava*. Syn. Neurop. N. A., 47.

Ephemerella Walsh.

cornuta Morgan. Ann. Ent. Soc. Am., iv, 114. (A.H.Mn.)

Callibætis Eaton.

ferrugineus Walsh. Trans. Am. Ent. Soc., xxvi, 250.

Siphlonurus Eaton.

aridus Say. *Bætis*. Syn. Neurop. N. A., 46.

mirus Eaton. Can. Ent., xlvii, 248.

typicus Eaton. *Ibid.,* xlvii, 253.

Heptagenia Walsh.

luridipennis Burmeister. Syn. Neurop. N. A., 49.

terminata Walsh. *Pentagenia*. Proc. Phila., Ent. Soc., ii, 203.

Order **MALLOPHAGA.**

Biting bird lice.

Family PHILOPTERIDÆ.

Goniocotes Burmeister.

abdominalis Piaget. *gigas* Taschenberg. Bur. Ent., Bull. 7, 32; Storrs Agr. Expt. Sta., Bull. 86, 180.

hologaster Nitzsch. Bur. Ent., Bull. 7, 33; Bull. 5, new ser., 192.

Lipeurus Nitzsch.

heterographus Nitzsch. Chicken head louse. Bur. Ent., Bull. 5, new ser., 231; Storrs Agr. Expt. Sta., Bull. 86, 178.

variabilis Nitzsch. Variable chicken louse. Bur. Ent., Bull. 5, new ser., 202.

Family LIOTHEIDÆ.

Menopon Nitzsch.

biseriatum Piaget. Large body hen louse. Bur. Ent., Bull. 5, new ser., 212; Storrs Agr. Expt. Sta., Bull. 86, 174.

pallidum Nitzsch. Small body hen louse. Common biting hen louse. Bur. Ent., Bull. 5, new ser., 210; Storrs Agr. Expt. Sta., Bull. 86, 174.

Nitzschia Denny.

pulicaris Nitzsch. Jour. N. Y. Ent. Soc., x, 225.

Order **NEUROPTERA.**

Family SIALIDÆ.

Corydalis Latreille.

cornuta Linnæus. Dobson. Hellgrammite. Insect Book, pl. xxiii, 15 and 16.

Chauliodes Latreille.

angusticollis Hagen. N. Y. State Mus., Bull. 68, 462.
pecticornis Linnæus. *Ibid.*, Bull. 68, 461: Insect Book, pl. xxxiii, 14.
rasticornis Rambur. N. Y. State Mus., Bull. 68, 460.
serricornis Say. *Ibid.*, Bull. 68, 459.

Sialis Latreille.

infumata Newman. N. Y. State Mus., Bull. 68, 448: Insect Book, pl. xxiii, 18.

Family HEMEROBIIDÆ.

Hemerobius Linnæus.

humuli Linnæus. Syn. Neurop. N. A., 205.
stigmaterus Fitch. *Ibid.*, 202.

Sympherobius Banks.

amiculus Fitch. *Hemerobius.* Syn. Neurop. N. A., 200.

Micromus Rambur.

posticus Walker. *Hemerobius.* Syn. Neurop. N. A., 204.

Family CHRYSOPIDÆ.

Chrysopa Leach.

harrisi Fitch. Trans. Am. Ent. Soc., xxix, 155.
nigricornis Burmeister. Insect Book, pl. xxvi, 2.
oculata Say. *Ibid.*, 223.

Family MYRMELEONIDÆ.

Myrmeleon Linnæus.

immaculatus DeGeer. Insect Book, pl. xxv, 2.

Brachynemurus Hagen.

abdominalis Say. Insect Book, pl. xxvi, 11.

Family ASCALAPHIDÆ.

Colobopterus Rambur.

excisus Hagen. Can. Ent., xix, 153. (H. J. G.)

Order MECOPTERA.

Family PANORPIDÆ.

Panorpa Linnæus.

americana Swederus. Bull. Sci. Lab., Denison Univ., xi, 250.
confusa Westwood. *Ibid.*, xi, 251.
maculosa Hagen. *Ibid.*, xi, 247.
nebulosa Westwood. *Ibid.*, xi, 247.
rufescens Rambur. Insect Book, pl. xxiii, 10.

Bittacus Latreille.

stigmaterus Say. Bull. Sci. Lab., Denison Univ., xi, 260.

Order TRICHOPTERA.

Family PHRYGANEIDÆ.

Phryganea Linnæus.

cinerea Walker. Syn. Neurop. N. A., 252.
interrupta Say. Compl. Writ., i, 98.

Neuronia Leach.

angustipennis Hagen. Verh. Zool-Bot. Ges. Wien., 1873, 400.
concatenata Walker. *Phryganea irrorata.* Syn. Neurop. N. A., 249.
postica Walker. *Ibid.*, 251.
stygipes Hagen. Verh. Zool-Bot. Ges. Wien., 1873, 388.

Family LIMNEPHILIDÆ.

Limnephilus Leach.

despectus Walker. Syn. Neurop. N. A., 259.
indivisus Walker. *Ibid.*, 260.
submonilifer Walker. *Ibid.*, 260.

Platycentropus Ulmer.

maculipennis Kolenati. *Hallesus hostis.* Syn. Neurop. N. A., 266.

Pycnopsyche Banks.

scabripennis Rambur. *Hallesus.* Syn. Neurop. N. A., 265.

Dicosmœcus McLachlan.

argus Harris. Entomological Correspondence, 333.

Stenophylax Kolenati.

divergens Walker. *Limnephilus.* Syn. Neurop. N. A., 255.

Chilostigma McLachlan.

difficilis Walker. *Limnephilus.* Syn. Neurop. N. A., 268.

Family RHYACOPHILIDÆ.

Chimarrhia Leach.

aterrima Hagen. Syn. Neurop. N. A., 297.

Family SERICOSTOMATIDÆ.

Helicopsyche Hagen.

borealis Hagen. *Notidobia.* Syn. Neurop. N. A., 271.

Family LEPTOCERIDÆ.

Leptocerus Leach.

sp.

Œcetina Banks.

avara Banks. Trans. Am. Ent. Soc. xxii, 316.
incerta Walker. *Leptocerus.* Syn. Neurop. N. A., 278.
sp. ?

Mystacides Latreille.

nigra Linnæus. *Leptocerus.* Syn. Neurop. N. A., 277.
sepulchralis Walk. *Leptocerus.* *Ibid.*, 277.

Setodes Rambur.

grandis Banks. Proc. Wash. Ent. Soc. viii, 128.

Family HYDROPSYCHIDÆ.

Macronema Pictet.

zebrata Hagen. Insect Book, pl. xxiii, 9.

Hydropsyche Pictet.

alternans Walker. *morosa.* Syn. Neurop. N. A., 288.
analis Banks. Jour. N. Y. Ent. Soc., 1903, 243.
scalaris Hagen. Syn. Neurop. N. A., 286.
sordida Hagen. *Ibid.*, 290.
sp.

Family HYDROPTILIDÆ.

Orthotrichia Eaton.

pictipes Banks. Trans. Am. Ent. Soc., xxxvii, 359.

Order **ODONATA.**

Dragonflies.

Family AGRIONIDÆ.

Agrion Fabricius.

Calopteryx Leach.

æquabile Say. Insect Book, pl. xlvi, 14.
amatum Hagen. Psyche, 5, 244.
maculatum Beauvois. Insect Book, pl. xlvi, 12.

Hetærina Hagen.

americana Fabricius. Insect Book, pl. xlvi, 9, 11.

Lestes Leach.

congener Hagen. Trans. Am. Ent. Soc., xx, 229.
disjunctus Selys. *Ibid.*, xx, 231.
eurinus Say. Insect Book, pl. xlvii, 11.
forcipatus Rambur. *Ibid.*, pl. xlvi, 1, 5.
inæqualis Walsh. Rept. Geol. Ind., 260.
rectangularis Say. *Ibid.*, pl. xlvii, 9.
uncatus Kirby. *Ibid.*, pl. xlviii, 3.
unguiculatus Hagen. *Ibid.*, pl. xlvii, 15.
vigilax Hagen. *Ibid.*, pl. xlvii, 8.

Argia Rambur.*

mœsta Hagen var. **putrida** Hagen. Insect Book, pl. xlvii, 10, 13.
violacea Hagen. Trans. Am. Ent. Soc., xx, 233.

Nehalennia Selys.

irene Hagen. Insect Book, pl. xlvi, 3.

Amphiagrion Selys.

saucium Burmeister. Insect Book, pl. xlvi, 2.

Chromagrion Needham.

conditum Hagen. N. Y. State Mus., Bull. 68, pl. 13, 1 and 2.

Enallagma Charpentier.

aspersum Hagen. Trans. Am. Ent. Soc., xx, 237.
civile Hagen. Insect Book, pl. xlvii, 12, 14.

* See also appendix.

carunculatum Morse. Psyche, 7, 208.
cyathigerum Charpentier. *annexum*. Ent. News, xi, 154.
divagans Selys. Trans. Am. Ent. Soc., xx, 238.
durum Hagen. Insect Book, pl. xlviii, 13.
ebrium Hagen. Rept. Geol. Ind., xxiv, 270.
exsulans Hagen. Insect Book, pl. xlvi, 4, 8.
geminatum Kellicott. Ent. News, vi, 239.
signatum Hagen. Insect Book, pl. xlvii, 1.
traviatum Selys. Rept. Geol. Ind., 1900, 271.
vesperum Calvert. *pollutum*. Trans. Am. Ent. Soc., xlv, 381.

Ischnura Charpentier.

posita Hagen. Insect Book, pl. xlvi, 7.
verticalis Say. *Ibid.*, pl. xlvii, 2, 3, 5.

Anomalagrion Selys.

hastatum Say. Insect Book, pl. xlvi, 16, 18.

Family ÆSCHNIDÆ.

Hagenius Selys.

brevistylus Selys. Trans. Am. Ent. Soc., xx, 241.

Ophiogomphus Selys.

johannus Needham. Can. Ent., xxix, 182.
rupinsulensis Walsh. Rept. Geol. Ind., xxiv, 298.

Lanthus Needham.

albistylus Hagen. *Gomphus nœvius*. Trans. Am. Ent. Soc., xx, 242. (L. B. W.)

Gomphus Leach.

abbreviatus Hagen. Trans. Am. Ent. Soc., xx, 243.
borealis Needham. N. Y. State Mus., Bull. 68, 265.
brevis Hagen. N. Y. State Mus., Bull., 47, 449.
exilis Selys. Trans. Am. Ent. Soc., xx, 243.
sordidus Hagen. *lividus* Selys. Ent. News, xiv, 256.
spicatus Hagen. Rept. Geol. Ind., 292, 1899.

Dromogomphus Selys.

spinosus Selys. N. Y. State Mus., Bull. 47, 462.

Cordulegaster Leach.

diastotops Selys. *lateralis*. Proc. Bost. Soc. Nat. Hist., x, 211.

erroneus Hagen. Trans. Am. Ent. Soc., xx, 246.
maculatus Selys. Insect Book, pl. xliv, 7.
obliquus Say. Rept. Geol. Ind., xxiv, 300.

Anax Leach.

junius Drury. Insect Book, pl. xl, 15.

Æshna Fabricius.

canadensis Walker. Can. Ent., xl, 384.
clepsydra Say. *Ibid.*, xl, 383.
constricta Say. Insect Book, pl. xli, 4.
juncea Linnæus. Can. Ent., xl, 385.
tuberculifera Walker. Can. Ent., xl, 385.
umbrosa Walker. *Ibid.*, xl, 380.
verticalis Hagen. Trans. Am. Ent. Soc., xx, 248.

Epiæschna Selys.

heros Fabricius. Insect Book, pl. xli, 7.

Boyeria MacLachlan.

vinosa Say. *Fonscolombia.* Insect Book, pl. xliv, 4.

Basiæschna Selys.

janata Say. Insect Book, pl. xliv, 1.

Gomphæschna Selys.

furcillata Say. Rept. Geol. Ind., xxiv, 302.

Family LIBELLULIDÆ

Didymops Rambur.

transversa Say. Insect Book, pl. xlv, 9.

Epicordulia Selys.

princeps Hagen. Insect Book, pl. xiv, 8.

Helocordulia Needham.

uhleri Selys. N. Y. State Mus., Bull. 47, 496.

Tetragoneuria Hagen.

cynosura Say. Trans. Am. Ent. Soc., xx, 252.
cynosura var. **simulans** Muttkowski. Bull. Wis. Acad. Sci., 95, 1911.
spinigera Selys. Rept. Geol. Ind., 311. 1899.
spinosa Hagen. N. Y. State Mus., Bull. 47, 495.

Somatochlora Selys.*

elongata Scudder, var. **minor** Calvert. Ent. News, ix, 87.
tenebrosa Say. Rept. Geol. Ind., 314. 1899.

Cordulia Leach.

shurtleffi Scudder. N. Y. State Mus., Bull. 47, 506.

Dorocordulia Needham.

lepida Hagen. N. Y. State Mus., Bull. 47, 506.
libera Selys. Rept. Geol. Ind., 314. 1899.

Libellula Linnæus.

auripennis Burmeister. Insect Book, pl. xlv, 6.
cyanea Fabricius. *Ibid.*, pl. xliv, 2, 3.
exusta Say. *Ibid.*, pl. xli, 5, 6.
incesta Hagen. Insect Book, pl. xliii, 3.
luctuosa Burmeister. *basalis*. *Ibid.*, pl. xliii, 2.
pulchella Drury. *Ibid.*, pl. xl, 7.
quadrimaculata Linnæus. *Ibid.*, pl. xl, 3.
semifasciata Burmeister. *Ibid.*, pl. xlv, 5.
vibrans Fabricius. *Ibid.*, pl. xl, 11.

Plathemis Hagen.

lydia Drury. *trimaculata*. Insect Book, pl. xl, 1, 5.

Erythrodiplax Brauer.

berenice Drury. *Micrathyria*. Insect Book, pl. xli, 1, 2, 3.

Nannothemis Brauer.

bella Uhler. Trans. Am. Ent. Soc., xx, 260.

Tramea Hagen.

carolina Linnæus. Insect Book, pl. xliii, 8.

Sympetrum Newman.

corruptum Hagen. *Diplax*. Insect Book, pl. xlii, 5.
costiferum Hagen. *Ibid.*, pl. xliv, 8, 9.
rubicundulum Say. *Diplax*. *Ibid.*, pl. xlii, 8, 9.
semicinctum Say. *Diplax*. *Ibid.*, pl. xliii, 7.
vicinum Hagen. *Diplax*. Trans. Am. Ent. Soc., xx, 264.

Leucorhinia Brittinger.

frigida Hagen. Trans. Am. Ent. Soc., xvii, 231. (L. B. W.)
glacialis Hagen. N. Y. State Mus., Bull. 47, 518.
intacta Hagen. Insect Book, pl. xliv, 5, 6.

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* See also appendix.

Celethemis Hagen.

elisa Hagen. Insect Book, pl. xl, 14.
eponina Drury. *Ibid.*, pl. xliii, 4.
monomelæna Williamson. Ohio Nat., 10. 1910.

Perithemis Hagen.

domitia Drury. *tenera* Say. Insect Book, pl. xl, 4, 6.

Erythemis Hagen.

simplicicollis Say. *Mesothemis*. Insect Book, pl. xli. 8, 9.

Pachydiplax Brauer.

longipennis Burmeister. Trans. Am. Ent. Soc., xx, 265.

Order **EUPLEXOPTERA.**

Earwigs.

Family FORFICULIDÆ.

Anisolabis Fieber.

maritima Bonnel. Maritime earwig. Conn. Geol. Nat. Hist. Surv., Bull. 16, 45.

Labia Leach.

minor Linnæus. Conn. Geol. Nat. Hist. Surv., Bull. 16, 47.

Order **ORTHOPTERA.**

Grasshoppers, Crickets, and Cockroaches.

Family BLATTIDÆ.

Parcoblatta Hebard.

pennsylvanica DeGeer. Pennsylvania cockroach. Conn. Geol. Nat. Hist. Surv., Bull. 16, 54.
uhleriana Saussure. *Ibid.*, Bull. 16, 55.
virginica Brunner, *Ischnoptera borealis.* Proc. Acad. Nat. Sci., Phila., 44. 1910.

Blattella Caudell.

germanica Linnæus. *Ectobia. Phyllodromia.* Croton bug. German cockroach. Bur. Ent., Bull. 4, new ser., 92: Conn. Geol. Nat. Hist. Surv., Bull. 16, 56.

Blatta Linnæus.

orientalis Linnæus. Oriental cockroach. Bur. Ent., Bull. 4, new ser., 91: Conn. Geol. Nat. Hist. Surv., Bull. 16, 57.

Periplaneta Burmeister.

americana Linnæus. American cockroach. Bur. Ent., Bull. 4, new ser., 84: Conn. Geol. Nat. Hist. Surv., Bull. 16, 58.
australasiæ Fabricius. Australian cockroach. Bur. Ent., Bull. 4, new ser., 91. Conn. Geol. Nat. Hist. Surv., Bull. 16, 59.

Nyctibora Burmeister.

noctivaga Rehn. *mexicana* Saussure. In bananas. Conn. Geol. Nat. Hist. Surv., Bull. 16, 53.

Pycnoscelus Scudder.

surinamensis Linnæus. *Leucophæa.* In greenhouse. Rept. Conn. Agr. Expt. Sta., 307. 1917.

Panchlora Burmeister.

cubensis Saussure. *poeyi. viridis.* Green cockroach. In bunches of bananas. Conn. Geol. Nat. Hist Surv, Bull. 16, 53.

Family PHASMIDÆ.

Diapheromera Gray.

femorata Say. Walking stick. Conn. Geol. Nat. Hist. Surv., Bull. 16, 62.

Family MANTIDÆ.

Tenodera Burmeister.

sinensis Saussure. *Paratenodera.* Chinese praying mantis. Conn. Geol. Nat. Hist. Surv., Bull. 16, 60.

Manomera Rehn and Hebard.

blatchleyi Caudell. Proc. U. S. Nat. Mus., 44, 612. (A.P.M.)

Family ACRIDIDÆ.

Nomotettix Morse.

cristatus Scudder. Crested grouse locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 66.

cristatus var. **carinatus** Scudder. *Ibid.,* Bull. 16, 67.

Tettix Charpentier.

angustus Hancock. Trans. Am. Ent. Soc., xxiii, 238. (A.P.M.)

granulatus Kirby. Conn. Geol. Nat. Hist. Surv., Bull. 16, 68.

ornatus Say. Ornate grouse locust. *Ibid.,* Bull. 16, 67.

Paratettix Bolivar.

cucullatus Burmeister. Hooded grouse locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 69.

Tettigidea Scudder.

parvipennis Harris. Conn. Geol. Nat. Hist. Surv., Bull. 16, 70.

parvipennis var. **pennata** Morse. *Ibid.,* Bull. 16, 70.

Eritettix Bruner.

carinatus Scudder. Conn. Geol. Nat. Hist. Surv., Bull. 16, 75.

Orphulella Giglio-Tos.

olivacea Morse. Conn. Geol. Nat. Hist. Surv., Bull. 16, 81.

pelidna Burmeister. Smaller spotted-winged locust. *Ibid.,* Bull. 16, 79.

speciosa Scudder. *Ibid.,* Bull. 16, 80.

Dicromorpha Morse.

viridis Scudder. Short-winged green locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 76.

Chlœaltis Harris.

conspersa Harris. Sprinkled locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 83.

Stenobothrus Fischer.

curtipennis Harris. Short-winged brown locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 83.

Mecostethus Fieber.

lineatus Scudder. Conn. Geol. Nat. Hist. Surv., Bull. 16, 85.

platypterus Scudder. *Ibid.*, Bull. 16, 86. (A. P. M.)

Arphia Stål.

sulphurea Fabricius. Sulphur-winged locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 89.

xanthoptera Germar. *Ibid.*, Bull. 16, 90.

Chortophaga Saussure.

viridifasciata DeGeer. Green-striped locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 90.

Encoptolophus Scudder.

sordidus Burmeister. Clouded locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 92.

Camnula Stål.

pellucida Scudder. Clear-winged locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 92.

Hippiscus Saussure.

tuberculatus Beauvois. Coral-winged locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 94.

Dissosteira Scudder.

carolina Linnæus. Carolina locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 96.

Spharagemon Scudder.

bolli Scudder. Conn. Geol. Nat. Hist. Surv., Bull. 16, 99.

collare Scudder, var. **scudderi** Morse. *Ibid.*, Bull 16, 98.

collare var. **wyomingianum** Thomas. Mottled sand locust. *Ibid.*, Bull. 16, 98.

saxatile Morse. *Ibid.*, Bull. 16, 100.

Scirtetica Saussure.

marmorata Harris. Conn. Geol. Nat. Hist. Surv., Bull. 16, 101.

Psinidia Stål.

fenestralis Serville. Long-horned locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 103.

Trimerotropis Stål.

maritima Harris. Maritime locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 104.

Circotettix Scudder.

verruculatus Kirby. Conn. Geol. Nat. Hist. Surv., Bull. 16, 105.

Pseudopomala Morse.

brachyptera Scudder. Conn. Geol. Nat. Hist. Surv., Bull. 16, 73.

Schistocerca Stål.

alutacea Harris. Leather-colored locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 108.

americana Drury. American locust. *Ibid.*, Bull. 16, 108.

rubiginosa Harris. Rusty locust. *Ibid.*, Bull. 16, 109.

Melanoplus Stål.

atlanis Riley. Lesser locust. Conn. Geol. Nat. Hist. Surv., Bull. 16, 117.

bivittatus Say. Yellow-striped locust. *Ibid.*, Bull. 16, 121.

fasciatus Walker and Barnston. *Ibid.*, Bull. 16, 119.

femur-rubrum DeGeer. Red-legged locust. *Ibid.*, Bull. 16, 118.

luridus Dodge. *Ibid.*, Bull. 16, 120.

mancus Smith. *Ibid.*, Bull. 16, 115.

minor Scudder. *Ibid.*, Bull. 16, 119.

punctulatus Uhler. Grizzly locust. *Ibid.*, Bull. 16, 122.

scudderi Uhler. Scudder's short-winged locust. *Ibid.*, Bull. 16, 116.

Paroxya Scudder.

floridana Thomas. Conn. Geol. Nat. Hist. Surv., Bull. 16, 123

Family LOCUSTIDÆ.

Scudderia Stål.

curvicauda DeGeer. Curve-tailed katydid. Conn. Geol. Nat. Hist. Surv., Bull. 16, 127.

furcata Bruner. Fork-tailed katydid. *Ibid.*, Bull. 16, 128.

pistillata Bruner. *Ibid.*, Bull. 16, 128.

septentrionalis Serville. *Ibid.*, Bull. 16, 129.

texensis Saussure-Pictet. *Ibid.*, Bull. 16, 126.

Amblycorypha Stål.

oblongifolia DeGeer. Oblong-winged katydid. Conn. Geol. Nat. Hist. Surv., Bull. 16, 130.

rotundifolia Scudder. Round-winged katydid. *Ibid.*, Bull. 16, 130.

Cyrtophyllus Burmeister.

perspicillatus Linnæus. *concavus*. True katydid. Conn. Geol. Nat. Hist. Surv., Bull. 16, 131.

Conocephalus Thunberg.

ensiger Harris. Sword-bearer. Conn. Geol. Nat. Hist. Surv., Bull. 16, 133.
exiliscanorus Davis. *Ibid.*, Bull. 16, 134.
robustus Scudder. *Ibid.*, Bull. 16, 135.
triops Linnæus. *Ibid.*, Bull. 16, 135.

Orchelimum Serville.

concinnum Scudder. *herbaceum*. Conn. Sttate Geol. Nat. Hist. Surv., Bull. 16, 139.
gladiator Bruner. Can. Ent., xxiii, 71.
vulgare Harris. Common meadow grasshopper. Conn. Geol. Nat. Hist. Surv., Bull. 16, 139.

Xiphidium Serville.

brevipenne Scudder Short-winged meadow grasshopper. Conn. Geol. Nat. Hist. Serv., Bull 16, 137.
ensiferum Scudder. *Ibid.*, Bull. 16, 137. (W. S. B.)
fasciatum DeGeer. Slender meadow grasshopper. *Ibid.*, Bull. 16, 137.
spartinæ Fox. Ent. News, xxiii, 1111. (A.P.M.)

Atlanticus Scudder.

dorsalis Burmeister. Conn. Geol. Nat. Hist. Surv., Bull. 16, 141.
pachymerus Burmeister. *Ibid.*, Bull. 16, 141.

Ceutophilus Scudder.

brevipes Scudder. Conn. Geol. Nat. Hist. Surv., Bull. 16, 145.
gracilipes Haldeman. *Ibid.*, Bull. 16, 143.
grandis Scudder. *Ibid.*, Bull. 16, 144.
latens Scudder. *Ibid.*, Bull. 16, 146.
maculatus Harris. *Ibid.*, Bull. 16, 145.
neglectus Scudder. *Ibid.*, Bull. 16, 147.
pallidipes Walker. *Ibid.*, Bull. 16, 146.
terrestris Scudder. *Ibid.*, Bull. 16, 144.

Family GRYLLIDÆ.

Gryllotalpa Linnæus.

borealis Burmeister. Northern mole cricket. Conn. Geol. Nat. Hist. Surv., Bull. 16, 149.

Tridactylus Olivier.

terminalis Uhler. Conn. Geol. Nat. Hist. Surv., Bull. 16, 150.

Nemobius Serville.

carolinus Scudder. Conn. Geol. Nat. Hist. Surv., Bull. 16, 152.

fasciatus DeGeer. *vittatus*. Small black cricket. Striped ground cricket. *Ibid.*, Bull. 16, 151.

griseus Walker. Can. Ent., xxxiv, 182.

maculatus Blatchley. Orthop. Ind., 424.

palustris Blatchley. Marsh ground cricket. Conn. Geol. Nat. Hist. Surv., Bull. 16, 152.

Gryllus Linnæus.

abbreviatus Serville. Common field cricket. Conn. Geol. Nat. Hist. Surv., Bull. 16, 154.

domesticus Linnæus. House cricket. Conn. Geol. Nat. Hist. Surv., 16, 154.

pennsylvanicus Burmeister. Pennsylvania field cricket. *Ibid.*, Bull. 16, 154.

Œcanthus Serville.

angustipennis Fitch. Narrow-winged tree cricket. Conn. Geol. Nat. Hist. Surv., Bull. 16, 158.

exclamationis Davis. *Ibid.*, Bull. 16, 158.

nigricornis Walker. *fasciatus* Fitch. Striped tree cricket. *Ibid.*, *Bull.* 16, 159.

niveus DeGeer. Snowy tree cricket. *Ibid.*, Bull. 16, 157.

pini Beutenmüller. Pine tree cricket. *Ibid.*, Bull. 16, 160. (W. B.)

quadripunctatus Beutenmüller. Four-spotted tree cricket. *Ibid.*, Bull. 16, 159.

Anaxipha Saussure.

exigua Say. Conn. Geol. Nat. Hist. Surv., Bull. 16, 162.

Xabea Walker.

bipunctatus DeGeer. Two-spotted tree cricket. Conn. Geol. Nat. Hist. Surv., Bull. 16, 161.

Order **THYSANOPTERA** (PHYSOPODA).

Family ÆOLOTHRIPIDÆ.

Æolothrips Haliday.

fasciatus Linnæus. *Coleothrips trifasciata.* Proc. U. S. Nat. Mus., xxvi, 127.

Family THRIPIDÆ.

Euthrips Targioni-Tozzetti.

tritici Fitch. *Thrips.* Wheat thrips. Proc. U. S. Nat. Mus., xxvi, 148.

Anaphothrips Uzel.

striatus Osborn. Grass thrips. Proc. U. S. Nat. Mus., xxvi, 161.

Heliothrips Haliday.

femoralis Heeger. *cestri.* Proc. U. S. Nat. Mus., xxvi, 172.
hæmorrhoidalis Bouché. *Ibid.,* xxvi, 168.

Parthenothrips Uzel.

dracænæ Heeger. Proc. U. S. Nat. Mus., xxvi, 176.

Thrips Linnæus.

perplexus Beach. Proc. U. S. Nat. Mus., xxvi, 184.
tabaci Lindeman. Onion thrips, *Ibid.,* xxvi, 179: Rept. Conn. Agr. Expt. Sta., 1903, 266.

Family PHLŒOTHRIPIDÆ.

Anthothrips Uzel.

verbasci Osborn. Proc. U. S. Nat. Mus., xxvi, 189.
sp.

Liothrips Uzel.

citricornis Hood. Can. Ent., xl, 306.

Leptothrips Hood.

aspersus Hinds. *Cryptothrips.* Proc. U. S. Nat. Mus., xxvi, 265.

Order **HEMIPTERA.**

Bugs, Lice, Aphids, Scale Insects, etc.

Suborder **PARASITICA.**

Family PEDICULIDÆ.

Pediculus Linnæus.

corporis DeGeer. *vestimenti* Leach. Body-louse of man. Bur. Ent. Bull. 5, new series.
humanus Linnæus. *capitis*. Head-louse of man. *Ibid.*, 166.

Phthirius Leach.

pubis Linnæus. *inguinalis* Leach. Crab-louse of man. Bur. Ent., Bull. 5, new series, 165.

Hæmatopinus Leach.

eurysternus Nitzsch. Short-nosed ox-louse. Bur. Ent., Bull. 5, new series, 172.

Linognathus Enderlein.

piliferus Burmeister. Sucking dog-louse. Bur. Ent., Bull. 5, new series, 169.
vituli Linnæus. Long-nosed ox-louse. *Ibid.*, 176.

Suborder **HOMOPTERA.**

Family FULGORIDÆ.

Scolops Schaum.

angustatus Uhler. Bull. Geol. Geog. Surv., I, 350.
sulcipes Say. Compl. Writ., ii, 254.

Phylloscelis Germar.

atra Germar. Proc. Acad. Nat. Sci. Phila., 1907, 472.
atra var. **albovenosa** Millichar. *Ibid.*, 1907, 472.

Elidiptera Spinola.

Helicoptera Amyot and Serville.

variegata Van Duzee. Proc. Acad. Nat. Sci. Phila., 1907, 479.
sp.

Catonia Uhler.

grisea Van Duzee. Proc. Acad. Nat. Sci. Phila., 1907, 480, 482.
impunctata Fitch. *Myndus. Ibid.*, 1907, 480, 482.

Oliarus Stål.

cinnamomeus Provancher. Proc. Acad. Nat. Sci. Phila., 1907, 485, 488.
complectus Ball. *Ibid.*, 1907, 485, 488.
humilis Say. *Ibid.*, 1907, 485, 488.

Cixius Latreille.

basalis Van Duzee. Bull. Buff. Soc. Nat. Sci., v, 191.
colœpeum Fitch. Proc. Acad. Nat. Sci. Phila., 1907, 489, 490.
misellus Van Duzee. (erroneously *stigmaticus*) Can. Ent., xxxviii, 408.
pini Fitch. *Ibid.*, xxxviii, 408.

Œcleus Stål.

borealis Van Duzee. Bull. Buff. Soc. Nat. Sci., x, 495.
campestris Ball. Can. Ent., xxxiv, 156.
decens Stål. Berl. Ent., Zeitschr., vi, 307.

Myndus Stål.

fulvus Osborn. Ohio Nat., iv, (2) 46.

Bruchomorpha Newman.

oculata Newman. Can. Ent., xxi, 7.

Acanalonia Spinola.

Amphiscepa Uhler.

bivittata Say. *Flata.* Insect Book, Pl. xxviii, 20. Compl. Writ., ii, 255.

Ormenis Stål.

pruinosa Say. *Flata.* Insect Book, Pl. xxvii, 28. Compl. Writ., ii, 373.
septentrionalis Spinola. Insect Book, Pl. xxvii, 24, 27; Ann. Soc. Ent. France, Ser. i, viii, 1839.

Lamenia Stål.

obscura Ball. Can. Ent. xxxiv, 262.
vulgaris Fitch. Cat. Ins. N. Y., 47, 1851.

Otiocerus Kirby.

amyoti Fitch. Ins. N. Y., iii, 394.
degeerii Kirby. Trans. Linn. Soc. London, xiii, 16.

Stenocranus Fieber.

dorsalis Fitch, var. **vittatus** Stål. (*lautus* Van Duzee.) Bull. Buff. Soc. Nat. Sci., v, 231.

Kelisia Fieber.

axialis Van Duzee. Bull. Buff. Soc. Nat. Sci., v, 191.

Prokelisia Osborn.

marginata Van Duzee. Bull. Buff. Soc. Nat. Sci., v, 235.

Pissonotus Van Duzee.

ater Van Duzee. Bull. Buff. Soc.. Nat. Sci., v, 190.

Stobæra Stål.

tricarinata Say. *Delphax*. Compl. Writ., ii, 255.

Liburniella Crawford.

ornata Stål. Berl. Ent. Zeitschr., vi, 315.

Liburnia Stål.

campestris Van Duzee. Bull. Buff. Soc. Nat. Sci., v, 191.
laminalis Van Duzee. *Ibid.*, v, 251.
lateralis Van Duzee. *Ibid.*, v, 253.
lutulenta Van Duzee. *Ibid.*, v, 191.
pellucida Fabricius. *Ibid.*, v, 191.
puella Van Duzee. *Ibid.*, v, 191.

Family CICADELLIDÆ.*

Jassoidea.

Agallia Curtis.

constricta Van Duzee. Can. Ent., xxvi, 90.
novella Sav. Proc. Acad. Nat. Sci. Phila., 1831, 6, 309.
quadripunctata Provancher. Nat. Can., 1872, 4, 376.
sanguinolenta Provancher. *Ibid.*, 1872, 4, 376.

Idiocerus Lewis.

lachrymalis Fitch. Ohio State Univ., Bull. 22, 507, 1905.
pallidus Fitch. *Ibid.*, Bull. 22, 505, 1905.
fitchi Van Duzee. *maculipennis*. Proc. Dav. Acad. Sci., vii, 73, 127.
provancheri Van Duzee. Buff. Soc. Nat. Sci., Bull. 5, 194.
scurra Germar. *gemmisimulans* Leonard and Crosby. Jour. Econ. Ent., 8, 542.
sp.

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* See also appendix.

Macropsis Lewis.

Pediopsis Burmeister.

trimaculata Fitch. *insignis* Van Duzee. Ent. Amer., v, 172.
viridis Fitch. Rept. N. Y. State Ent., 9, 399.
virescens Gmelin, var. **graminea** Fabricius. Me. Agr. Expt. Sta., Bull. 239, 90.

Oncopsis Burmeister.

cognatus Van Duzee. Ent. Amer., vi, 225.
fitchi Van Duzee. *fenestratus* Fitch. Rept. N. Y. State Ent., 9, 400.
minor Fitch. Ent. Amer., vi, 228.
sobrius Walker. *Ibid.*, vi, 223.
variabilis Fitch. Ent. Amer., vi, 224.
sp.

Oncometopia Stål.

lateralis Fabricius, var. **limbata** Say. Compl. Writ., ii, 258.

Cicadella Latreille.

Tettigoniella Jacoby.

gothica Signoret, *Tettigonia*. Ohio State Univ. Bull., ser. 5, No. 21, 19.

Kolla Distant.

bifida Say. *Tettigonia*. Bull. Ill. State Lab. Nat. Hist., iii, 27.
tripunctata Fitch. *Tettigonia*. Ohio State Univ. Bull., Ser. 5, No. 21, 26.

Helochara Fitch.

communis Fitch. Ohio State Univ. Bull., Ser. 5, No. 21, 28.

Graphocephala Van Duzee.

Diedrocephala Ball.

coccinea Fœrster. *Tettigonia*. Bull. Ill. State Lab. Nat. Hist., iii, 23.
coccinea var. **teliformis** Walker. Bull. Buff. Soc. Nat. Sci., ix, 214.

Dræculacephala Ball.

angulifera Walker. Ohio State Univ. Bull., Ser. 5, No. 21, 33, 35.
minor Walker. Bull. Buff. Soc. Nat. Sci., ix, 214.

mollipes Say. *Tettigonia.* Bull. Ill. State Lab. Nat. Hist., iii, 24.
noveboracensis Fitch. *Tettigonia.* *Ibid.*, iii, 24.

Penthimia Germar.

americana Fitch. Rept. N. Y. State Ent., ix, 397.

Gypona Germar.

bipunctulata Woodworth. Bull. Ill. State Lab. Nat. Hist., iii, 30.
cinerea Uhler. Bull. Geol. Geog. Surv., 3, 460.
geminata Osborn. Rept. N. Y. State Ent., xx, 513.
melanota Spangberg. Spec. Gyponæ, 1878, 23.
octolineata Say. *striata. flavilineata.* Bull. Ill. State Lab. Nat. Hist., iii, 30.
rugosa Spangberg. Rept. N. Y. State Ent., 20, 513.
scarlatina Fitch. *Ibid.*, ix, 397.

Stroggylocephalus Flor.

agrestris Fallen. Bull. Buff. Soc. Nat. Sci., v, 197.

Xerophlœa Germar.

major Baker. Psyche, viii, 285.
viridis Fabricius. Proc. Iowa Acad. Sci., iv, 179.

Acucephalus Germar.

albifrons Linnæus. *Tettigonia mixta.* Compl. Writ., ii, 258.

Parabolocratus Fieber.

viridis Uhler. Bull. Geol. Geog. Surv., 3, 462, 1877.

Mesamia Ball.

vitellina Fitch. *Paramesus.* Rept. N. Y. State Ent., 9, 399.

Scaphoideus Uhler.

auronitens Provancher. Jour. Cin. Soc. Nat. Hist., xix, 194.
carinatus Osborn. Ohio Nat., xi, 251.
consors Uhler. Jour. Cin. Soc. Nat. Hist., xix, 196.
immistus Say. *Ibid.*, xix, 204.
intricatus Uhler. *Ibid.*, xix, 202.
lobatus Van Duzee. Ohio Nat., xi, 250.
luteolus Van Duzee. Jour. Cin. Soc. Nat. Hist., xix, 203.
melanotus Osborn. Ohio Nat., xi, 251.
opalinus Osborn. Rept. N. Y. State Ent., 20, 525.
productus Osborn. Jour. Cin. Soc. Nat. Hist., xix, 200.
unicolor Osborn. *consors* var. *unicolor.* *Ibid.*, xix, 196.
sp.

Platymetopius Burmeister.

acutus Say. *Jassus.* Compl. Writ., ii, 382.
frontalis Van Duzee. Can. Ent., xxii, 112.
frontalis var.
hyalinus Osborn. Ent. News, xi, 501.
magdalensis Provancher. Tenn. State Bd. Ent., Bull. 17, 41.

Deltocephalus Burmeister.

apicatus Osborn. Me. Agr. Expt. Sta., Bull. 238, 120.
balli Van Duzee. *nigrifrons.* Bur. Ent., Bull., 198, 77.
configuratus Uhler. Bull. Geol. Geog. Surv., iv, 511, 1871.
flavicosta Stål. *flavocostatus.* Can. Ent., xxiv, 116.
inimicus Say. *Jassus.* Compl. Writ., ii, 382; Me. Agr. Expt. Sta., Bull. 238, 123.
littoralis Ball. Bull. Buff. Soc. Nat. Sci., ix, 221.
melsheimerii Fitch. Tenn. State Bd. Ent., Bull., 17, 48.
minimus Osborn and Ball. *Ibid.*, 17, 47.
pascuellus Fallen. *minki* Fieber. Me. Agri. Expa. Sat., Bull., 238, 118.
pictus Osborn. Tenn. State Bd. Ent., Bull. 17, 43.
sayi Fitch. *Ibid.*, Bull. 17, 46.
simplex Van Duzee. Trans. Am. Ent. Soc., xix, 304.
sylvestris Osborn and Ball. Tenn. State Bd. Ent., Bull., 17, 49.

Driotura Osborn and Ball.

gammaroides Van Duzee. Me. Agr. Expt. Sta., Bull, 238, 132.

Euscelis Brullé.

Athysanus Burmeister.

anthracinus Van Duzee. Ohio Nat., ii, 241.
curtisii Fitch. *Ibid.*, ii, 251.
extrusus Van Duzee. *Ibid.*, ii, 237.
relativus Gillette and Baker. *obsoletus. Ibid.*, ii, 239.
striatulus Fällen. *plutonius* Uhler. *Ibid.*, ii, 240.
striolus Fallen. *Ibid.*, ii, 235.
uhleri Ball. Can. Ent., xliii, 200.
vaccini Van Duzee. Ohio Nat., ii, 242.
varus Ball. *Ibid.*, ii, 239.

Eutettix Van Duzee.

cinctus Osborn and Ball. Proc. Dav. Acad. Sci., xii, 64.
johnsoni Van Duzee. *Mesamia. Ibid.*, xii, 66.

marmoratus Van Duzee. *Ibid.*, xii, 35.
seminudus Say. *Athysanus. Ibid.*, xii, 42.
strobi Fitch. *Ibid.*, xii, 44.

Phlepsius Fieber.

collitus Ball. Can Ent., xxxv, 227.
fulvidorsum Fitch. Trans. Am. Ent. Soc., xix, 74.
fuscipennis Van Duzee. *Ibid.*, xix, 70.
incisus Van Duzee. *Ibid.*, xix, 73.
irroratus Say. *Ibid.*, xix, 71.
lobatus Osborn. Proc. Ia. Acad. Sci., v, 247.
majestus Osborn and Ball. Tenn. St. Bd. Ent., Bull. 17, 76.
nebulosus Van Duzee. Trans. Am. Ent. Soc., xix, 77.
solidaginis Walker. *humidus. Ibid.*, xix, 76.

Acinopterus Van Duzee.

acuminatus Van Duzee. Psyche, vi, 308.

Thamnottettix Zetterstedt.

brittoni Osborn. Proc. Dav. Acad. Sci., x, 166.
clitellarius Say. *Jassus.* Compl. Writ., ii, 384.
eburatus Van Duzee. Can. Ent., xxi, 10.
kennicotti Uhler. Proc. Ent. Soc. Phila., ii, 161.
melanogaster Provancher. Nat. Can., iv, 378.
nigrifrons Forbes. *perpunctata* Van Duzzee. Ins. Ill., 14, 67.

Chlorotettix Van Duzee.

balli Osborn. Proc. Iowa Acad. Sci., v, 247.
galbanatus Van Duzee. Psyche, vi, 309.
lusorius Osborn and Ball. Proc. Iowa Acad. Sci., iv, 226.
tergatus Fitch. Psyche, vi, 309.
unicolor Fitch. *Ibid.*, vi, 308.
viridius Van Duzee. *Ibid.*, vi, 309.

Jassus Fabricius.

olitorius Say. *subbifasciatus.* Jour. Acad. Nat. Sci. Phila., vi, 301, 1831.

Cicadula Zetterstedt.

sexnotata Fallen. Tenn. State Bd. Ent., Bull. 17, 94.
variata Fallen. *Ibid.*, Bull. 17, 95.

Balclutha Kirkaldy.

impicta Van Duzee. *Gnathodus*. Can. Ent., xxiv, 113.
punctata Thunberg. Me. Agr. Expt. Sta., Bull., 238, 149.

Alebra Fieber.

albostriella Fallen, var. **fulveola** Herrich-Schæffer. Proc. U. S. Nat. Mus., xx, 713.

Dicraneura Hardy.

mali Provancher. *communis* Gillette. Proc. U. S. Nat. Mus., xx, 718.

Empoasca Walsh.

flavescens Fabricius. Proc. U. S. Nat. Mus., xx, 745.
mali Le Baron. Apple leaf-hopper. Rept. Conn. Agr. Expt. Sta., 1904, 216.
smaragdula Fallen. Proc. U. S. Nat. Mus., xx, 725.
trifasciata Gillette. *Ibid.*, xx, 726.
unica Provancher. *splendida* Gillette. *Ibid.*, xx, 731.

Typhlocyba Germar.

Eupteryx Curtis.

flavoscuta Gillette. Proc. U. S. Nat. Mus., xx, 749.
melissæ Curtis. *collina* Flor. Bull. Buff. Soc. Nat. Sci., x, 511.
nigra Osborn. Ohio State Univ., Bull. 22, 543.

Empoa Fitch.

Typhlocyba Sahlberg.

fabæ Harris. Ins. Inj. Veg., 230.
lethierryi Edwards. Me. Agr. Expt. Sta., Bull., 238, 157.
querci Fitch. Proc. U. S. Nat. Mus., xx, 766.
querci Fitch, var. **gilletti** Van Duzee. *bifasciata*. Me. Agr. Expt. Sta., Bull., 238, 157.
rosæ Linnæus. Rose leaf-hopper, Proc. U. S. Nat. Mus., xx, 771.
ulmi Linnæus. Proc. U. S. Nat. Mus., xx, 769.

Erythroneura Fitch.

comes Say. Grape leaf-hopper. Proc. U. S. Nat. Mus., xx, 759.
comes var. **maculata** Gillette. *Ibid.*, xx, 764.
obliqua Say. *Ibid.*, xx, 756.
vulnerata Fitch. *Ibid.*, xx, 764.

Family MEMBRACIDÆ.

Campylenchia Stål.

latipes Say. *curvata* Stål. Bull. Buff. Soc. Nat. Sci., ix, 111.

Enchenopa Amyot and Serville.

binotata Say. Bull. Buff. Soc. Nat. Sci., ix, 112.

Ceresa Amyot and Serville.

albescens Van Duzee. Bull. Buff. Soc. Nat. Sci., ix, 35. (W.E.B.)

basalis Walker. *turbida*. Bull. Buff. Soc. Nat. Sci., ix, 33, 39.

borealis Fairmaire. *Ibid.*, ix, 34, 38.

brevicornis Fitch. *Ibid.*, ix, 34, 40.

brevis Walker. *Ibid.*, ix, 34, 40.

bubalus Fabricius. Buffalo tree-hopper. Insect Book, Pl. xxvii, 18; Bull. Buff. Soc. Nat. Sci., ix, 33, 36.

constans Walker. Bull. Buff. Soc. Nat. Sci., ix, 37. (L.B.W.)

diceros Say. *Ibid.*, ix, 33, 35.

palmeri Van Duzee. *Ibid.*, ix, 38. (L.B.W.)

taurina Fitch. *Ibid.*, ix, 34, 37.

Stictocephala Stål.

inermis Fabricius. Bull. Buff. Soc. Nat. Sci., ix, 44.

lutea Walker. *Ibid.*, ix, 43, 49.

Micrutalis Fowler.

calva Say. Bull. Buff. Soc. Nat. Sci., ix, 53.

dorsalis Fitch. *Ibid.*, ix, 53. (L.B.W.)

Carynota Fitch.

mera Say. Bull. Buff. Soc. Nat. Sci., ix, 55, 56.

porphyrea Fairmaire. *Ibid.*, ix, 56, 57.

stupida Walker. *muskokensis* Goding. *Ibid.*, ix, 56.

Thelia Amyot and Serville.

bimaculata Fabricius. Bull. Buff. Soc. Nat. Sci., ix, 57.

Glossonotus Butler.

acuminatus Fabricius. Bull. Buff. Soc. Nat. Sci., ix, 58, 59.

cratægi Fitch. *Ibid.*, ix, 58, 59.

godingi Van Duzee. *Ibid.*, ix, 58, 59.

univittata Harris. *Ibid.*, ix, 58.

Telamona Fitch.

ampelopsidis Harris. Bull. Buff. Soc. Nat. Sci., ix, 63, 68.
barbata Van Duzee. *Ibid.*, ix, 62, 65. (L.B.W.)
coryli Fitch. *Ibid.*, ix, 63, 68.
declivata Van Duzee. *Ibid.*, ix, 61, 64.
decorata Ball. Proc. Wash. Biol. Soc., xvi, 179. (I.W.D.)
dubiosa Van Duzee. *irrorata*. Bull. Ill. St. Lab. Nat. Hist., iii, 418. (L.B.W.)
extrema Ball. Bull. Buff. Soc. Nat. Sci., ix, 64, 71. (M.P.Z.)
maculata Van Duzee. *Ibid.*, ix, 63, 72.
querci Fitch. *Ibid.*, ix, 62, 67.
reclivata Fitch. *Ibid.*, ix, 62, 67. (D.J.C.)
sinuata Fowler. *Ibid.*, ix, 63, 69. (L.B.W.)
subfalcata Van Duzee. *Ibid.*, x, 509. (L.B.W.)
tristis Fitch. *coryli*. *Ibid.*, ix, 63, 68. (H.L.V.)
unicolor. Fitch. *Ibid.*, ix, 64, 71.

Smilia Germar.

camelus Fabricius. Bull. Buff. Soc. Nat. Sci., ix, 74.
camelus var. **viridis** Goding. Bull. Ill. State Lab. Nat. Hist., iii, 426.
sp.

Cyrtolobus Goding.

cinctus Van Duzee. Bull. Buff. Soc. Nat. Sci., ix, 80, 86. (L.B.W.)
cinereus Emmons. *Ibid.*, ix, 81, 91.
discoidalis Emmons. *Ibid.*, ix, 80, 90. (L.B.W.)
• **fenestratus** Fitch. *Ibid.*, ix, 79, 81.
fuliginosus Emmons. *Ibid.*, ix, 79, 82.
fuscipennis Van Duzee. *Ibid.*, ix, 81, 91. (L.B.W.)
inermis Emmons. *Ibid.*, ix, 81, 90. (Q.S.L.)
intermedius Emmons. *Ibid.*, ix, 80, 90. (L.B.W.)
maculipennis Emmons. *Ibid.*, ix, 81, 89. (L.B.W.)
muticus Fabricius. *trilineatus* Say. *Xantholobus*. *Ibid.*, ix, 96.
ovatus Van Duzee. *Ibid.*, ix, 96.
sculptus Fairmaire. Ibid., ix, 79, 85. (L.B.W.)
tuberosus Fairmaire. *Ibid.*, ix, 79, 84. (L.B.W.)
vau Say. *Ibid.*, ix, 80, 87.

Atymna Stål.

castaneæ Fitch. Bull. Buff. Soc. Nat. Sci., ix, 92, 93.
inornata Say. *Ibid.*, ix, 92, 93. (L.B.W.)
querci Fitch. *Ibid.*, ix, 92, 93.

Xantholobus Van Duzee.

muticus Fabricius. *trilineatus* Say. Bull. Buff. Soc. Nat. Sci., ix, 96.

Ophiderma Fairmaire.

flava Goding. Bull. Buff. Soc. Nat. Sci., ix, 98, 100.
flavicephala Goding. Insect Life, v, 92. (M.P.Z.)
flaviguttula Goding. Bull. Ill. State Lab. Nat. Hist., iii, 438.
flaviguttula var. **definita** Woodruff. Jour. N. Y. Ent. Soc., xxvii, 259. (L.B.W.)
grisea Woodruff. *Ibid.*, xxvii, 254. (L.B.W.)
pubescens Emmons. Bull. Buff. Soc. Nat. Sci., ix, 99.
salamandra Fairmaire. *Ibid.*, ix, 98, 99.

Vanduzea Goding.

arcuata Say. Bull. Buff. Soc. Nat. Sci., ix, 102. (L.B.W.)

Entylia Germar.

bactriana Germar. *carinata*. Bull. Buff. Soc. Nat. Sci., ix, 105.

Publilia Stål.

concava Say. Bull. Buff. Soc. Nat. Sci., ix, 106.

Family CERCOPIDÆ.

Monecphora Amyot and Serville.

Tomaspis Stål.

bicincta Say var. **ignipecta** Fitch. Ins. N. Y., iii, 71, in Rept. Agr. Soc., 389.

Aphrophora Germar.

parallela Say. *Cercopis*. Compl. Writ., i, 202.
quadrinotata Say. Compl. Writ., ii, 381.
saratogensis Fitch. Cat. Homop. N. Y., 53, 710.

Lepyronia Amyot and Serville.

quadrangularis Say. Compl. Writ., ii, 256.

Philænus Stål.

lineatus Linnæus. Rept. N. Y. State Ent., iv, 240.

Philaronia Ball.

bilineata Say. *americanus* Baker. Can. Ent., xxix, 112.

Clastoptera Germar.

obtusa Say var. **obtusa** Ball. Compl. Writ., ii, 256.
obtusa var. **achatina** Germar. Cat. Homop. N. Y., 53.
proteus Fitch. Cat. Homop. N. Y., 54, 722.
proteus var. **saint-cyri** Provancher. Nat. Can., iv, 351.
proteus var. **pini** Fitch. Cat. Homop. N. Y., 53.

Family CICADIDÆ.

Tibicen Latreille.

auletes Germar. Large dog day harvest fly, Jour. N. Y. Ent. Soc., xxiii, 2.
canicularis Harris. Dog day harvest fly, Ent. News, xviii, 126.
linnei Smith and Grossbeck. Ent. News, xviii, 127.
lyricen DeGeer. *fulvula* Osborn. *Ibid.*, xviii, 125.
lyricen var. **englehardti** Davis. *Ibid.*, xxi, 457.
sayi Smith and Grossbeck. *Ibid.*, xviii, 124.

Tibicina Kollar.

septendecim Linnæus. Seventeen year locust or periodical cicada. Bur. Ent., Bull. 71; Rept. Conn. Agr. Expt. Sta., 1911, 296.

Family PSYLLIDÆ.

Livia Latreille.

maculipennis Fitch. Psyche xix, 6.
marginata Patch. *Ibid.*, xix, 8.
vernalis Fitch. *Diraphia.* Rept. Ins. N. Y., iv, 53: **Psyche,** xix, 7.

Aphalara Fœrster.

veaziei Patch. Me. Agr. Expt. Sta., Bull. 187, 16.

Trioza Fœrster.

tripunctata Fitch. Rept. N. Y. State Ent., ix, 404.

Calophya Fr. Loew.

flavida Schwarz. Proc. Wash. Ent. Soc., vi, 243.
nigripennis Riley. *Ibid.*, vi, 244.

Pachypsylla Riley.

celtidis-gemma Riley. Proc. Wash. Biol. Soc., ii, 74.
celtidis-mamma Riley. *Ibid.,* ii, 73.
celtidis-vesiculum Riley. Am. Mus. Jour., iv, 35.
venusta Osten Sacken. Proc. Wash. Biol. Soc., ii, 72.

Spanioneura Fœrster.

fonscolombii Fœrster.[1] Verh. Zool-Bot. Ges. Wien., 1879, pl. ix, 26.

Psylla Geoffroy.

annulata Fitch. U. S. Nat. Mus., Bull. 85, 152. (W. C. W.)
buxi Linnæus. Verh. Zool-Bot. Ges. Wien., 1881, 169.
floccosa Patch. Can. Ent., xli, 301.
galeaformis Patch. Me. Agr. Expt. Sta., Bull. 187, 12.
pyricola Fœrster. *pyri.* Pear psylla. Rept. Conn. Agr. Expt. Sta., 1903, 262.
striata Patch. Me. Agr. Expt. Sta., Bull. 187, 14.

Psyllopsis Fr. Loew.

fraxinicola Fœrster. U. S. Nat. Mus., Bull. 85, 132: Rept. N. Y. State Ent., xxvi, 39.

[1]This species on *Buxus sempervirens* has not been identified with certainty.

Family APHIDIDÆ.

Longistigma Wilson.

caryæ Harris. *Lachnus caryæ, L. longistigma* Monell, *L. platanicola* Riley. Can. Ent., 41, 385.

Anœcia Koch.

corni Fabricius. *Aphis. Schizoneura panicola* Thomas. U. S. Dept. Agr., Div. Ent., Bull. 22, 32.

Todolachnus Matsumura.

pinicola Kaltenbach. *abietis.* Fitch. 5th Rept. U. S. Ent. Com., 853.
strobi Fitch. Me. Agr. Expt. Sta. Bull. 202, 167.

Calaphis Walsh.

betulæcolens Fitch. *Callipterus.* Aphid. Minn., 43.
castaneæ Fitch. *Ibid.,* 44.

Callipterinella van der Goot.

annulata Koch. *Chaitophorus.* Jour. Econ. Ent., 10, 427.

Euceraphis Walker.

betulæ Koch. *Callipterus.* Jour. Econ. Ent., 10, 425.
mucida Fitch. *Callipterus. Ibid.,* 425.

Monellia Oestlund.

caryæ Monell. *Callipterus.* U. S. Dept. Agr., Bull. 100, 19.
castalis Fitch. Jour. Econ. Ent., 10, 424.

Myzocallus Passerini.

discolor Monell. *Callipterus.* Aphid. Minn., 41.
punctatellus Fitch. *Aphis.* Jour. Econ. Ent., 10, 420.
ulmifolii Monell. *Callipterus.* Aphid. Minn., 42.

Therioaphis Walker.

tilliæ Linnæus. *Aphis.* Ann. Ent. Soc. Am., 2, 33.

Chaitophorus Koch.

nigræ Oestlund. *cordata* Williams. Jour. Econ. Ent., 429.
viminalis Monell. *stevensis* Sanborn. Aphid. Minn., 40.

Neothomasia Baker.

bruneri Williams. *Chaitophorus.* Univ. Studies, Lincoln, Neb., 11, No. 3, reprint 6.
populicola Thomas. Me. Agr. Expt. Sta., Bull. 213, 78.

Periphyllus Van der Hoven.

americanus Baker. Jour. Econ. Ent., 10, 428.
lyropicta Kessler. *Ibid.,* 10, 428.

Drepanaphis Del Guercio.

acerifoliæ Thomas. *Siphonophora. Drepanosiphum.* Kan. Univ. Sci., Bull., 3, 45.

Drepanosiphum Koch.

platanoides Schrank. *Aphis.* Jour. Econ. Ent., 2, 346.

Phyllaphis Koch.

fagi Linnæus. Beech aphid. Aphid. Minn., 32.

Melanoxantherium Schouteden.

media Baker. Jour. Econ. Ent., 10, 431.
smithiæ Monell. *Melanoxanthus.* Jour. Econ. Ent., 2, 387.

Aphis Linnæus.

cardui Linnæus. *pruni. prunifoliæ.* Me. Agr. Expt. Sta., Bull. 233, 263.

cerasifoliæ Fitch. Choke-cherry aphid. *Ibid.*, 262.

davisi Patch. Jour. Econ. Ent., 10, 418. (N. N. for *Aphis populifoliæ* Fitch of Davis, 1910.)

folsomi Davis. Ent. News, 19, 145.

gossypii Glover. *malvæ* Koch., *cucurbiti* Buckton. Melon aphid. Rept. Conn. Agr. Expt. Sta., 1908, 813.

laburni Kaltenbach. Afid. Ital., 125.

maidi-radicis Forbes. Corn root aphid. Bur. Ent., Bull. 85, 97.

maidis Fitch. Bur. Ent., Tech. Ser., 12, 144.

nerii Boyer. Oleander aphid. Pom. Jour. Ent., iii, 530.

persicæ-niger Smith. Black peach aphid. Jour. Econ. Ent., i, 308.

pomi DeGeer. Green apple aphid. Rept. Conn. Agr. Expt. Sta., 1903, 259.

pseudobrassicæ Davis. Turnip aphid. *Ibid.*, 1916. Texas Agr. Expt. Sta., Bull. 180; Rept. Conn. Agr. Expt. Sta., 1916, 98.

rumexicolens Patch. Jour. Econ. Ent., 10, 417.

rumicis Linnæus. Bean aphid. Aphid. Minn., 61.

saliceti Kaltenbach. Jour. Econ. Ent., 10, 417.

sanborni Patch. Me. Agr. Expt. Sta., Bull. 225, 52.

spiræcola Patch. *spiræella* Gillette. Me. Agr. Expt. Sta., 233, 270.

viburniphila Patch. Jour. Econ. Ent., 10, 416.

yuccæ Cowen. *yucciola* Williams. Yucca aphid. Hemip. Col., 122.

Anuraphis Del Guercio.

malifoliæ Fitch. *sorbi* Kaltenbach. Rosy apple aphid. Rept. Conn. Agr. Expt. Sta., 1909, 343; Thirteenth Rept. Del. Agr. Expt. Station, 1900, 149.

tulipæ Boyer. *Aphis gladioli* Felt. Rept. N. Y. State Ent., 24, 19.

Brevicoryne Das.

brassicæ Linnæus. Cabbage aphid. Ins. Life, iii, 289; Cornell Univ. Agr. Expt. Sta., Bull. 300.

Hyalopterus Koch.

arundinis Fabricius. *Aphis pruni*. Jour. Econ. Ent., 2, 354.

Rhopalosiphum Koch.

nymphææ Linnæus. *Aphis. butoni. aquaticus. prunorum.* Science, 42, 164. Me. Agr. Expt. Sta., Bull. 233, 263.
prunifoliæ Fitch. (*avenæ* in part) Aphid. Minn., 65.
serotinæ Oestlund. *Ibid.*, 76.

Siphocoryne Passerini.

xylostei Schrank. *Aphis.* Afid. Ital., 142.

Amphorophora Buckton.

rhois Monell. Aphid. Minn., 75.

Myzus Passerini.

braggii Gillette. *Capitophorus.* Jour. Econ. Ent., 8, 375.
cerasi Fabricius. *Aphis.* Cherry aphid. Aphid. Minn., 73; Me. Agr. Expt. Sta., Bull. 233, 258.
persicæ Sulzer. Green peach aphid. Ins. N. Y., iii, 359.
ribis Linnæus. Currant aphid. Aphid. Minn., 74.
rosarum Kaltenbach. Me. Agr. Expt. Sta., Bull. 233, 269.
violæ Pergande. *Rhopalosiphum.* Violet aphid. Can. Ent., xxxii, 29.

Macrosiphum Passerini.

albifrons Essig. Pom. Jour. Ent., 3, 543.
cratægi Monell. *Siphonophora cratægi.* Me. Agr. Expt. Sta., Bull. 233, 255.
granarium Kirby. Jour. Econ. Biol., viii, 58.
illinoiensis Shimer. Science 41, 834.
lilii Monell. *Siphonophora.* Rept. U. S. Entomologist, 1879, 220.
liriodendri Monell. Ins. Ill., 8, 189; Jour. Econ. Ent., 4, 383.
luteola Williams. *Siphonophora.* University Studies, Lincoln, Nebraska, 11, No. 3, reprint 31.
pisi Kaltenbach. U. S. Rept. Agr., Bull. 276.
rosæ Linnæus. *Aphis rosæ.* Me. Agr. Expt. Sta., Bull. 233, 268.
rudbeckiæ Fitch. *Nectarophora rudbeckiæ.* Proc. Ent. Soc. Phila., i, 298; Jour. Econ. Ent., 4, 383.
sanborni Gillette. *Siphonophora chrysanthemicolens* Williams. Can. Ent., xl, 65.
solanifolii Ashmead. *Siphonophora.* Can. Ent., xiv, 92; Me. Agr. Expt. Sta., Bull. 242.

sonchi Linnæus. *Aphis sonchi.* Jour. Econ. Biol., viii, 64.
tanaceti Linnæus. *Aphis tanaceti.* Ins. Ill., viii, 68. Jour. Econ. Ent., 4, 382.

Eriosoma Leach.

americana Riley. *Schizoneura* Hartig. Me. Agr. Expt. Sta., Bull. 241; Bull. 256, 340 (Key). Jour. Agr. Research, 6, 359.
lanigera Hausman. Woolly apple aphid. Bur. Ent., U. S. Dept. Agr., Rept. No. 101; Me. Agr. Expt. Sta., Bull. 256.
lanuginosa Hartig. Me. Agr. Expt. Sta., Bull. 256, 340 (Key).
rileyi Thomas. Me. Agr. Expt. Sta., Bull. 256, 340 (Key).
ulmi Linnæus. Jour. Agr. Research, 6, 359; Me. Agr. Expt. Sta., Bull. 256, 340 (Key).

Tetraneura Hartig.

graminis Monell. *colophoidea* Howard. *ulmicola* Gillette.

Asiphum Koch.

pseudobyrsa Walsh. Ent. News, 25, 269.

Prociphilus Koch.

approximatus Patch. Jour. Econ. Ent., 10, 418.
corrugatans? Sirrene. Jour. Agr. Research, 5, 1117.
imbricator Fitch. Woolly beech aphid.
tessellata Fitch. *Schizoneura acerifolii.* "Alder blight." Jour. Econ. Ent., ii, 35.

Neoprociphilus Patch.

aceris Monell. Jour. Agr. Research, 5, 1117.

Thecabius Koch.

populi-condupliformis Cowen. *patchii* Gillette. Hemip. Col., 115.

Pemphigus Hartig.

populicaulis Fitch. Me. Agr. Expt. Sta., Bull. 213, 77.

Hormaphis Osten Sacken.

hamamelidis Fitch. Aphid. Minn., 24; Bur. Ent., Tech. Series, No. 9, 9.

Hamamelistes Shimer.

spinosus Shimer. *papyraceæ.* Aphid. Minn., 19; Bur. Ent., Tech. Series, No. 9, 25.

Chermes Linnæus.

abietis Kaltenbach. Spruce gall aphid. Rept. Conn. Agr. Expt. Sta., 1906, 302; Me. Agr. Expt. Sta., Bull. 173.
cooleyi Gillette. Proc. Acad. Nat. Sciences Phila., 1907, reprint, 3-14.
pinicorticis Fitch. Pine bark aphid. Ins. Aff. Park & Wood. Trees, 192.
pinifoliæ Fitch. *abieticolens*. Me. Agr. Expt. Sta., Bull. 173.
strobilobius Kaltenbach. Woolly larch aphid. Ins. Aff. Park & Wood. Trees, 187.

Phylloxera Boyer.

caryæcaulis Fitch. Hickory gall aphid. Ins. Aff. Park and Wood. Trees, 331; Proc. Davenport Acad. Sci., 9, 243.
castaneæ Haldeman. Proc. Davenport Acad. Sci., 9, 257.
foveola Pergande. *Ibid.*, 9, 188.
rimosalis Pergande. *Ibid.*, 9, 216.
vastatrix Planchon. Grape phylloxera. Insects and Insecticides, 1st ed. 109.

Family ALEYRODIDÆ.

Aleurochiton Tullgren.

forbesii Ashmead. *Aleurodes aceris* Forbes. Bur. Ent., Tech. Ser. 27, 88.

Aleyrodes Latreille.

asarumis Shimer. *acteæ* Britton. Ent. News, xvi, 65.
fernaldi Morrill. Psyche, x, 83.

Trialeurodes Cockerell.

Asterochiton Quaintance and Baker.
Aleyrodes.

coryli Britton. Ent. News, xviii, 337.
morrilli Britton. *Ibid.*, xviii, 340.
packardi Morrill. Can. Ent., xxxv, 25.
vaporariorum Westwood. Greenhouse white fly. Rept. Conn. Agr. Expt. Sta., 1902, 148.
waldeni Britton. Ent. News, xviii, 339.

Tetraleurodes Cockerell.

mori Quaintance, var. **maculata** Morrill. Psyche, x, 81.

Family COCCIDÆ.

Orthezia Bosc d'Antic.

insignis Douglas. Greenhouse orthezia. Rept. Conn. Agr. Expt. Sta., 1905, 235.

Asterolecanium Targioni-Tozzetti.

variolosum Ratzeburg. Pit-making oak scale. Rept. Conn. Agr. Expt. Sta., 1905, 235.

Kermes Boitard.

kingii Cockerell. Ohio Acad. Sci., iv, part 2, 36.
pubescens Bogue. *Ibid.*, iv, part 2, 37.
sassceri King. Jour. Ent. Zool., vi, 48.
waldeni King. Jour. Econ. Ent., vii, 150.

Gossyparia Signoret.

spuria Modeer. *ulmi.* Elm scale. Rept. Conn. Agr. Expt. Sta., 1905, 235.

Eriococcus Targioni-Tozzetti.

azaleæ Comstock. Cornell Agr. Expt. Sta., Bull. 372, 487.

Phenacoccus Cockerell.

acericola King. Woolly maple leaf scale. Rept. Conn. Agr. Expt. Sta., 1905, 226.

Pseudococcus Westwood.

adonidum Linnæus. *Dactylopius longispinus.* Long-tailed mealy bug. Jour. Econ. Ent., ii, 431.
citri Risso. *Dactylopius destructor.* Common or short-tailed mealy bug. Rept. Conn. Agr. Expt. Sta., 1905, 236.

Eriococcus Targioni-Tozzetti.

vitis Linnæus. *innumerabilis.* Cottony maple scale. Jour. Econ. Ent., ii, 433.

Coccus Linnæus.

hesperidum Linnæus. *Lecanium.* Soft brown scale. In greenhouses. Jour. Econ. Ent., ii, 436.

Toumeyella Cockerell.

liriodendri Gmelin. *Eulecanium tulipiferæ.* Tulip tree scale. Rept. Conn. Agr. Expt. Sta., 1905, 239; Jour. Econ. Ent., ii, 447.

Lecanium Burmeister.

caryæ Fitch. Hickory Lecanium. Jour. Econ. Ent., ii, 442.

corni Bouché. *armeniacum, canadense, cerasifex*. European fruit lecanium. Jour. Econ. Ent.; ii, 443; Rept. Conn. Agr. Expt. Sta., 1905, 237.

nigrofasciatum Pergande. Terrapin scale. Rept. Conn. Agr. Expt. Sta., 1905, 238.

Saissetia Deplanches.

hemisphærica Targioni-Tozzetti. *filicum*. Hemispherical scale. Rept. Conn. Agr. Expt. Sta., 1905, 239.

Physokermes Targioni-Tozzetti.

piceæ Schrank. Spruce scale. Can. Ent., 49, 317.

Chionaspis Signoret.

americana Johnson. White elm scale. Rept. Conn. Agr. Expt. Sta., 1905, 239.

caryæ Cooley. Mass. Agr. Expt. Sta., Spec. Bull., 1899, 40.

corni Cooley. *Ibid.*, Spec. Bull., 1899, 15.

euonymi Comstock. Euonymus scale. Rept. Conn. Agr. Expt. Sta., 1905, 240.

furfura Fitch. *harrisii*. Scurfy scale. *Ibid.*, 1903, 227.

lintneri Comstock. Mass. Agr. Expt. Sta., Spec. Bull., 1899, 22.

pinifoliæ Fitch. Pine leaf scale. Rept. Conn. Agr. Expt. Sta., 1905, 240.

Hemichionaspis Cockerell.

aspidistræ Signoret. In greenhouses. Mass. Agr. Expt. Sta., Spec. Bull., 1899, 45.

Diaspis Costa.

boisduvalii Signoret. In greenhouses. Ohio Acad. Sci., 1904, 52.

carueli Targioni-Tozzetti. Juniper scale. Rept. U. S. Dept. Agr., 1880, 310.

echinocacti Bouché, var. **cacti** Comstock. In greenhouses. Cornell Agr. Expt. Sta., Bull. 372, 552.

piricola Del Guercio. *Epidiaspis*. European pear scale. Ent. News, xi, 590.

Aulacaspis Cockerell.

pentagona Targioni-Tozzetti. West Indian peach scale. Rept. Conn. Agr. Expt. Sta., 1913, 240.
rosæ Bouché. *Diaspis.* Rose scale. *Ibid.,* 1905, 241.

Leucaspis Targioni-Tozzetti.

japonica Cockerell. Psyche, viii, 53.

Aspidiotus Bouché.

abietis Schrank. Hemlock leaf scale. 5th Rept. U. S. Ent. Com., 878.
ancylus Putnam. Putnam's scale. Ohio Acad. Sci., 1904, 57.
cyanophylli Signoret. In greenhouses. *Ibid.,* 1904, 59.
forbesi Johnson. Cherry scale. Bull. Ill. State Lab. Nat. Hist., iv, 380.
hederæ Vallot. *nerii.* White scale. Oleander scale. In greenhouses. Rept. Conn. Agr. Expt. Sta., 1905, 242.
osborni Newell and Cockerell. Proc. Iowa Acad. Sci., v, 229.
ostreæformis Curtis. European fruit scale. Bur. Ent., Bull. 20, 76.
perniciosus Comstock. San José scale. Conn. Agr. Expt. Sta., Bull. 165.
ulmi Johnson. Elm aspidiotus. Bull. Ill. State Lab. Nat. Hist., iv, 388.

Chrysomphalus Ashmead.

aonidum Linnæus. *ficus.* Circular scale. Fig scale. In greenhouses. Rept. Conn. Agr. Expt. Sta., 1905, 243.
aurantii Maskell. Red orange scale. In greenhouses. Ohio Acad. Sci., 1904, 71.
dictyospermi Morgan. Morgan's scale. In greenhouses. Rept. Conn. Agr. Expt. Sta., 1905, 244.
obscurus Comstock. Report U. S. Dept. Agr., 1880, 303.

Lepidosaphes Shimer.

beckii Newman. *Mytilaspis citricola.* Purple scale. In greenhouses. Ohio Acad. Sci., 1904, 73.
newsteadi Sulc. Rept. Conn. Agr. Expt. Sta., 1915, 140.
ulmi Linnæus. *Mytilaspis pomorum.* Oyster-shell scale. *Ibid.,* 1903, 229.

Ischnaspis Douglas.

longirostris Signoret. *filiformis*. Thread scale. In greenhouses. Rept. Conn. Agr. Expt. Sta., 1905, 245.

Parlatoria Targioni-Tozzetti.

pergandii Comstock. Chaff scale. In greenhouses. Ohio Acad. Sci., 1904, 75.

Suborder HETEROPTERA.

Family CORIXIDÆ.

Arctocorixa Wallengren.

alternata Say. Compl. Writ., ii, 251.
compressa Abbott. Wash. Univ. Studies, ii, 81.
compressa var.
interrupta Say. Compl. Writ., ii, 250.
kennicottii Uhler. Trans. Md. Acad., i, 393.
lucida Abbott. Ent. News, xxvii, 341.
nitida Fieber. Bull. Brook. Ent. Soc., viii, 88, 89.
ornata Abbott. Ent. News, xxvii, 341.
scabra Abbott. Bull. Brook. Ent. Soc., viii, 88, 90.
seriata Abbott. Ent. News, xxvii, 342.

Corixa Geoffroy.

verticalis Fieber. Bull. Brook. Ent. Soc., viii, 89, 90.

Family BELOSTOMATIDÆ.

Benacus Stål.

griseus Say. Insect Book, Pl. xxvii, 4.

Lethocerus Mayr.

americanus Leidy. *Belostoma*. Giant water bug. Life Hist. Amer. Insects, 4.

obscurus Dufour. *Belostoma*. Ann. Soc. Ent. France, 1863, 383.

Belostoma Latreille.

flumineum Say. Compl. Writ., i, 364.

Family NEPIDÆ.

Nepa Linnæus.

apiculata Uhler. Proc. Bos. Soc. Nat. Hist., xix, 140.

Ranatra Fabricius.

americana Montandon. *quadridentata* Uhler. Can. Ent., xxxvii, 187; Insect Book, Pl. xxvii, fig. 2 (as *fusca.*).

Family NAUCORIDÆ.

Pelocoris Stål.

femoratus Beauvois. *Naucoris poeyi.* Stand. Nat. Hist., ii, 259.

Family NOTONECTIDÆ.

Notonecta Linnæus.

insulata Kirby. Jour. N. Y. Ent. Soc., xiii, 162. (J.R.T.B.)
irrorata Uhler. Insect Book, Pl. xxvii, 12; Jour. N. Y. Ent. Soc., xiii, 159.
undulata Say. Jour. N. Y. Ent. Soc., xiii, 152.
undulata var. **latona** Kirkaldy.
variabilis Fieber. Jour. N. Y. Ent. Soc., xiii, 155.

Plea Leach.

striola Fieber. Stand. Nat. Hist., ii, 253.

Family SALDIDÆ.

Pentacora Reuter.

hirta Say. *Salda.* Compl. Writ., i, 359.
ligata Say. *Salda. Ibid.,* i, 359.

Salda Fabricius.

coriacea Uhler. Bull. Geol. Geog. Surv. Terr., iii, (2) 436.

Saldula Van Duzee.

confluenta Say. Compl. Writ., i, 361.
interstitialis Say. *Salda.* Compl. Writ., ii, 248.
pallipes Fabricius. *Salda.* Bull. Geol. Geog. Surv. Terr., iii, (2) 446.
reperta Uhler. *Salda. Ibid.,* 446.
saltatoria Linnæus. Act. Soc. Sci. Fenn., xxi, (2) 15.

Family VELIIDÆ.

Microvelia Westwood.

americana Uhler. Hemip. Col., 61.

Family GERRIDÆ.

Gerris Fabricius.

buenoi Kirkaldy. Ent. News, xxii, 246.
canaliculatus Say. Compl. Writ., i, 363.
conformis Uhler. Trans. Am. Ent. Soc., xxxvii, 247.
marginatus Say. Insect Book, Pl. xxix, 38; Compl. Writ., i, 362.
remigis Say. *Ibid.*, Pl. xxvii, 6; Compl. Writ., i, 362.
rufoscutellatus Latreille. Gen. Ins., iii, 134.

Metrobates Uhler.

hesperius Uhler. Proc. Bost. Soc. Nat. Hist., xiv, 108.

Family MIRIDÆ (CAPSIDÆ).

Chlamydatus Curtis.

associatus Uhler. Hayden's Geol. Surv. Mont., 1872, 419.

Campylomma Reuter.

verbasci Meyer. Hemip. Gymn. Eur., I (2), 53.

Apocremnus Fieber.

ancorifer Fieber. *Psallus.* Hemip. Gymn. Eur., I, 104.

Plagiognathus Fieber.

annulatus Uhler. Hemip. Col., 51.
blatchleyi Reuter. Ofv. Finska. Vet. Soc. Forh., liv., Afd., A, No. 7, 61.
confusus Reuter. Act. Soc. Sci. Fenn., xxxvi, (2) 80.
fraternus Uhler. Hemip. Col., 51.
obscurus Uhler. Hayden's Geol. Surv. Mont., 1872, 418 (C.R.E.)
politus Uhler. Hemip. Col., 52 (C.R.E.)

Rhinocapsus Uhler.

vanduzeei Uhler. Trans. Md. Acad., 1890, 82 (E.L.D.).

Microphylellus Reuter.

modestus Reuter. Finsk. Vet. Soc. Forh., Bd. liv., 1912, 62.

Reuteroscopus Kirkaldy.

ornatus Reuter. *Episcopus.* Ofv. Vet. Akad. Forh., 1875, 90.

Lopus Hahn.

decolor Fallen *chrysanthemi.* Hemip. Gymn. Eur., 11, 287.

Macrotylus Fieber.

amœnus Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxvi, (2) 75.

Halticus Hahn.

citri Ashmead. *uhleri* Gerard. Garden flea hopper. Ent. Amer., iii, 155; Rept. Conn. Agr. Expt. Sta., 1904, 217.

intermedius Uhler. Proc. U. S. Nat. Mus., xxvii, 360.

Strongylocoris Blanchard.

stygicus Say. *Capsus. Stiphrosoma.* Compl. Writ., i, 344.

Pseudoxenetus Reuter.

scutellatus Uhler. *Xenetus.* Trans. Md. Acad., 1890, 80.

Sericophanes Reuter.

noctuans Knight. Ent. News, xxviii, 3; Proc. Iowa Acad. Sci., V, 238.

Orectoderus Uhler.

obliquus Uhler. Bull. U. S. Geol. Sur. Terr., ii, 320.

Ceratocapsus Reuter.

fasciatus Uhler. Bull. U. S. Geol. Surv. Terr., viii, 421 (E.L.D.).

modestus Uhler. *Melinna.* Ent. Amer., iii, 69. (C.R.E.)

pumilus Uhler. *Melinna. Ibid.,* iii, 69. (C.R.E.)

Lopidea Uhler.

cæsar Reuter. Nearktische Capsiden Act. Soc. Sci. Fenn., xxxvi, (2) 72.

heidemanni Knight. Ent. News, xxviii, 456. (H.L.J.)

instabilis Reuter. *Ibid.,* xxxvi, (2) 72.

marginata Uhler. Proc. Cal. Acad. Sci., iv, 249.

media Say. Compl. Writ., i, 341.

reuteri Knight. Ent. News, xxviii, 459. (B.H.W.)

robiniæ Uhler. *Capsus.* Proc. Phila. Ent. Soc., i, 24.

staphyleæ Knight var. **sanguinea** Knight. Ent. News, xxviii, 461. (W.E.B.)

Orthotylus Fieber.

catulus Van Duzee. Proc. Cal. Acad. Sci., (4th ser) VI, 1916, 106.
chlorionis Say. *Ibid.*, 1916, 98.
cruciatus Van Duzee. *Ibid.*, 1916, 119.
flavosparsus Sahlberg. *Ibid.*, 1916, 97; Hemip. Gymn. Eur., 1883, 360.
uniformis Van Duzee. Proc. Calif. Acad. Sci., Ser. 4, vi, 99.

Ilnacora Reuter.

malina Uhler. Bull. U. S. Geol. Surv. Terr., iii, 419.

Hyaliodes Reuter.

vitripennis Say. *Capsus.* Compl. Writ., i, 345.

Dicyphus Fieber.

agilis Uhler. Bull. U. S. Geol. Surv., 1877, 425.
californicus Stål. Freg. Eugenies Resa, Hemip., 1859, 259.
vestitus Uhler. Hemip. Col., 46. (E.L.D.)

Macrolophus Fieber.

separatus Uhler. *Dicyphus.* Proc. Zool. Soc. London, 1893, 194. (C.R.E.)

Cylapus Say.

tenuicornis Say. Compl. Writ., i, 347.

Fulvius Stål.

brunneus Provancher. *Lygus. Pamerocoris anthocoroides.* U. S. Geol. Surv., Bull. iii, 1877, 425.

Monalocoris Dahlbom.

filicis Linnæus. *Cimex.* Syst. Nat., (10) 1758, 443.

Sixeonotus Reuter.

insignis Reuter. Ofv. Vet. Akad. Forh., 1875 (9) 78.

Cimatlan Distant.

catulum Uhler. Proc. Cal. Acad. Sci., (2) iv, 1894, 257.
venatorium Van Duzee. Bull. Buffalo Soc. Nat. Sci., X, 1912, 479.

Camptobrochis Fieber.

grandis Uhler. Ent. Amer., ii, 230.
nebulosus Uhler. Hayden's Geol. Surv. Mont., 1872, 417.

nitens Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxxvi, (2) 1909, 56. (C.R.E.)
validus Reuter var. **cunealis** Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxxvi, 59.

Deræocoris Kirschbaum.

ruber Linnæus. Syst. Nat. Ed. X, 1758, 446.
ruber var **danicus** Fabricius. Syst. Ent., iv, 181.
ruber var. **segusinus** Muller. Hemip. Gymn. Eur., V, 32.

Garganus Stal.

fusiformis Say. *Capsus*. Compl. Writ., i, 344, 1859.

Neurocolpus Reuter.

nubilus Say. *Capsus*. Compl. Writ., i, 341, 1859.

Phytocoris Fallen.*

eximius Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxvi, (2) 23, 1909.
fenestratus Reuter. *Ibid.*, xxvi, (2) 24, 1909.
infuscatus Reuter. *Ibid.*, xxvi, (2) 20. (C.R.E.)
puella Reuter. *Ibid.*, xxvi, (2) 20. (C.R.E.)
puella var. **confluens** Reuter. *Ibid.*, xxvi, (2) 20. (C.R.E.)
tibialis Reuter. *Ibid.*, xxvi, (2) 20.

Paracalocoris Distant.

scrupeus Say. *Capsus*. Compl. Writ., i, 342, 1859; Ann. Ent. Soc. Am., IX, 368.

Stenotus Jakolevsky.

binotatus Fabricius. *Oncognathus*. Ins. Life, v, 90. (O.H.)

Adelphocoris Reuter.

rapidus (Say) Reuter. *Calocoris*. Compl. Writ., i, 1859, 339.

Dichrooscytus Fieber.

suspectus Reuter. Act. Soc. Sci. Fenn., xxxvi, (2) 37, 1909.

Pœciloscytus Fieber.

basalis Reuter. *sericeus*. Bull. U. S. Geol. Surv., iii, 422, 1875.
venaticus Uhler, var.

* See also appendix.

Pœcilocapsus Reuter.

lineatus Fabricius. *Capsus 4-vittatus.* Four-lined leaf bug. N. Y. (Cornell) Agr. Expt. Sta. Bull., 58; Compt. Writ., i, 339.

Horcias Distant.

dislocatus Say. Het. New Harmony, 21, 1832; Bull. Buffalo Soc. Sci., X, 483.

dislocatus var. **affinis** Reuter. Nearktische Capsiden, Act. Soc. Sci Fenn., 41.

dislocatus var. **goniphorus** Say. Compl. Writ., i, 341.

dislocatus var. **limbatellus** Walker. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxxvi (2), 41.

dislocatus var. **nigrita** Reuter. *Ibid.,* 41.

dislocatus var. **scutellatus** Van Duzee. Bull. Buff. Soc. Nat. Sci., x, 484.

Capsus Fabricius.

ater Linnæus. Hemip. Gymn. Eur., v, 1896, 15.

ater var. **semiflavus** Linnæus. Syst. Nat., Ed. 12, i, 725.

Coccobaphes Uhler.

sanguinareus Uhler. Proc. Bos. Soc. Nat. Hist., xix, 401, 1878.

Tropidosteptes Uhler.

cardinalis Uhler. Proc. Bos. Soc. Nat. Hist., xix, 404, 1878.

Neoborus Distant.

amœnus Reuter var. *Neoborus saxeus.* Proc. Cal. Acad. Sci. (2) iv.

geminus Say. *Capsus.* Compl. Writ., i, 344.

palmeri Reuter. Bemerk. u. Nearktische Capsiden, 1909, 49.

Xenoborus Reuter.

pettiti Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., 50

Lygidea Reuter.

mendax Reuter. N. Y. (Cornell) Agr. Expt. Sta., Bull. 291.

Lygus Hahn.

belfragei Reuter. Ofv. Vet. Acad. Forh., 1875, 71.

caryæ Knight. N. Y. (Cornell) Agr. Expt. Sta., Bull. 391, 615. (B.H.W.)

caryæ var. **subfuscus** Knight. *Ibid.,* 616.

campestris Linnæus. *Orthops scutellatus.* Bull. U. S. Geol. Sur. Terr., iii, 420, 1877; Hemip. Gymn. Eur., v, 79.
communis Knight. Can. Ent. xlviii, 346.
fasciatus Reuter. Ofv. Vet. Akad. Forh., 1875, 72. (L.B.W.)
hirticulus Van Duzee. *tenellus.* N. Y. (Cornell) Agr. Expt. Sta., Bull. 391, 633.
inconspicuus Knight. *Ibid.*, 612. (B.H.W.)
invitus Say. *Capsus.* dark var. Compt. Writ., i, 1859, 345.
johnsoni Knight. N. Y. (Cornell) Agr. Expt. Sta., Bull. 391, 629. (C.W.J.)
olivaceus Reuter. Ofv. Finska Vet. Soc. Forh., lxix, 1907, 7.
omnivagus Knight. N. Y. (Cornell) Agr. Expt. Sta., Bull. 391, 627.
nyssæ Knight. Bull. Brook. Ent. Soc., xiii, 43.
pabulinus Linnæus. Hemip. Gymn. Eur., v, 114.
pabulinus var. **signifer** Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxxvi, 1909, 42.
pratensis Linnæus. Tarnished plant bug. Rept. Conn. Agr. Expt. Sta., 1904, 218.
pratensis var. **oblineatus** Say. N. Y. (Cornell) Agr. Expt. Sta., Bull., 391, 564.
rubicundus (Uhler) Reuter. Hemip. Gymn. Eur., v, 72.
tiliæ Knight. N. Y. (Cornell) Agr. Expt. Sta., Bull. 391, 613. (H.L.V.)
vanduzeei Knight var. **rubroclarus** Knight. *Ibid.*, Bull. 391, 567.
viburni Knight. *Ibid.*, 609. (B.H.W.)
vitticollis Reuter. *monachus.* Bur. Ent., Bull. 13, old ser., 63.

Platytylellus Reuter.

confraternus Uhler. *Resthenia.* Hayden's Surv. Terr. Rept. for 1871, 411.
insignis Say. *Capsus.* Compl. Writ., i, 1859, 342.
insitivus Say. *Capsus.* *Ibid.*, i, 1859, 340.

Trigonotylus Fieber.

brevipes Jakolevsky. Act. Soc. Sci. Fenn., xxxvi, (2) 1909, 6. (C.R.E.)
ruficornis Fourcroy. Ent. Paris, 1785, 209; Fallen, Hem. Suec., 1829, 133.

tarsalis Reuter. *Callimiris.* Act. Soc. Sci. Fenn., xxxvi, (2) 1909, 6.

uhleri Reuter. *Callimiris.* Ofv. Vet. Akad. Forh., 1875, 60.

Stenodema Laporte.

trispinosum Reuter. *Brachytropis calcaratus.* Nearktische Capsiden, Act. Soc. Fenn., xxxvi (2) 1909, 4.

vicinum Provancher. *Miris instabilis. affinis.* Rept. Geol. Geog. Surv., v, 1875, 836.

Miris Fabricius.

dolobratus Linnæus. Hayden's Geol. Surv. Mont., 1872, 409.

Mesomiris Reuter.

curtulus Reuter. Nearktische Capsiden, Act. Soc. Sci. Fenn., xxxvi, 5.

Collaria Provancher.

meilleurii Provancher. *Nabidea coracina.* Nat. Can., iv, 1872, 79.

oculata Reuter. *Trachelomiris.* Ofv. Vet. Akad. Forh., 1875 (9) 61.

Family ANTHOCORIDÆ.

Xylocoris Dufour.

Piezostethus Fieber.

cursitans Fallen. Ofv. Vet. Akad. Forh., 1871, 411.

sordidus Reuter. *Ibid.*, 560. (J.R.T.B.)

Triphleps Fieber.

insidiosa Say. Compl. Writ., i, 357.

Family CIMICIDÆ.

Cimex Linnæus.

lectularius Linnæus. Bed bug. Bur. Ent., Bull. 4, new series, 32.

Œciacus Stål.

vicarius Horvath. Barn swallow bug. Insect Book, 288; Bur. Ent., Bull. 5, new series, 161.

Family NABIDÆ.

Pagasa Stål.

fusca Stein. Berl. Ent. Zeit., i, 90.

Nabis Latreille.

Reduviolus Kirby.

annulatus Reuter. Ofv. Vet. Akad. Forh., xxix, 86.
ferus Linnæus. *Coriscus*. Syst. Nat., Ed. 10, 449.
inscriptus? Kirby. *Coriscus*. Can. Ent., x, 213.
roseipennis Reuter. *Coriscus*. Ofv. Vet. Akad. Forh., 1872, 87. (H.W.W.)
rufusculus Reuter. *Coriscus*. *Ibid*., 92.
subcoleoptratus Kirby. *Coriscus*. Insect Book, Pl. xxix, 30.

Family MESOVELIIDÆ.

Mesovelia Mulsant and Rey.

mulsanti White. *bisignata*. Stand. Nat. Hist., ii, 273 (H.L.V.)

Family HEBRIDÆ.

Hebrus Curtis.

concinnus Uhler. *Næogeus*. Proc. Zool. Soc., Lond., 1894, 221.

Family REDUVIIDÆ.

Ploiaricola Reuter.

tuberculata Banks. *Ploiariodes*. Psyche, xvi, 46.

Emesa Fabricius.

brevipennis Say. (*longipes* DeGeer, preoccupied.) Compl. Writ., i, 106.

Barce Stål.

annulipes Stål. Enum. Hemip., iii, 127.

Pygolampis Germar.

pectoralis Say. *Reduvius*. Compl. Writ., i, 306.

Reduvius Fabricius.

personatus Linnæus. Bur. Ent., Bull. 22, 24. (D.J.C.)

Melanolestes Stål.

abdominalis Herrich-Schæffer. Insect Book, Pl. xxxi, 38.
picipes Herrich-Schæffer. *Ibid.*, Pl. xxxi, 39.

Apiomerus Hahn.

crassipes Fabricius. Insect Book, Pl. xxix, 20.

Zelus Fabricius.

audax Banks. Ent. News, xxi, 325.
exsanguis Stål. *luridus*. Insect Book, Pl. xxix, 22; Stett. Ent. Zeit., 1862, 452.

Pselliopus Bergroth.

Milyas Stål.

cinctus Fabricius. Insect Book, Pl. xxxi, 43.

Fitchia Stål.

aptera Stål. Ofv. Vt. Akad. Forh., 1859, 371

Acholla Stål.

multispinosa DeGeer. Mem. Ins., iii, 23.

Sinea Amyot and Serville.

diadema Fabricius. Insect Book, Pl. xxxi, 44; Jour. N. Y. Ent. Soc. ix, 3.
spinipes Herrich-Schæffer. Enum. Hemip., ii, 71. (L.B.W.)

Family PHYMATIDÆ.

Phymata Latreille.

erosa Linnæus. Insect Book, 297.
erosa var. **fasciata** Gray. Griffith's Animal Kingdom, xv, 242. (E.L.D.)
erosa var. **wolfii** Stål. *pennsylvanica* Handlirsch. Insect Book, Pl. xxxi, 36.
vicina Handlirsch. Bull. Buff. Soc. Nat. Sci. ix, 174.

Family PIESMIDÆ.

Piesma Lepeletier and Serville.

cinera Say. *Tingis*. Compl. Writ., i, 349.

Family TINGIDÆ.

Corythucha Stål.

arcuata Say. *Tingis.* Insect Book, 299; Compl. Writ., i, 350.
ciliata Say. *Tingis.* Compl. Writ., 1, 349.
cratægi Osborn and Drake. Bull. Ohio St. Univ., xx, 229.
juglandis Fitch. *Tingis.* Insects N. Y., iii, 466.
marmorata Uhler. *Tingis.* Proc. Bos. Soc. Nat. Hist., xix, 415.
pallipes Parshley. Trans. Am. Ent. Soc., xliv, 82. (H.M.P.)
pergandei Heidemann. Proc. Wash. Ent. Soc., viii, 10.

Leptobyrsa Stål.

rhododendri Horvath. *explanata* Heidemann. Proc. Wash. Ent. Soc., x, 105.

Gargaphia Stål.

angulata Heidemann. Can. Ent., xli, 301.
tiliæ Walsh. Proc. Ent. Soc. Phila., iii, 408. (L.B.W.)

Leptostyla Stål.

clitoriæ Heidemann. *heidemanni* Osborn and Drake. Proc. Wash. Ent. Soc., xiii, 137.

Physatocheila Fieber.

plexa Say. Compl. Writ., i, 349. (E. L. D.)
variegata Parshley. Psyche, xxiii, 166.

Leptoypha Stål.

mutica Say. Compl. Writ., i, 349.

Melanorhopala Stål.

clavata Stål. *Tingis.* Enum. Hemip., iii, 130.

Hesperotingis Parshley.

antennata Parshley. Psyche, xxiv, 21.

Family LYGÆIDÆ.

Oncopeltus Stål.

fasciatus Dallas. Enum. Hemip., iv, 103. (G.H.H.)

Lygæus Fabricius.

kalmii Stål. Enum. Hemip., iv, 107.
reclivatus Say. Compl. Writ., i, 329.

Ortholomus Stål.

longiceps Stål. Enum. Hemip., iv, 120.

Nysius Dallas.

californicus Stål. Enum. Hemip., iv, 120.
ericæ Schilling. *angustatus.* Insect Book, 311; Hayden's Geol. Surv. Mont., 406.

Ischnorrhynchus Fieber.

geminatus Say. *Lygæus.* Compl. Writ., 1, 330.

Cymus Hahn.

angustatus Stål. Enum. Hemip., iv, 126.
luridus Stål. *Ibid.,* iv, 126.

Ischnodemus Fieber.

falicus Say. Compl. Writ., i, 331.

Blissus Burmeister.

hirtus Montandon. Ann. Soc. Ent. Belg., xxxvii, 405.
leucopterus Say. Chinch bug. Insect Book, 311; Bur. Ent., Bull. 69.

Geocoris Fallen.

bullatus Say. Compl. Writ., i, 336.
bullatus var. **discopterus** Stål. Enum. Hemip., iv, 136.
uliginosus Say var. **limbatus** Stål. *Ibid.,* iv, 136.
uliginosus var. **speculator** Montandon. Bull. Soc. Sci. Buc., xvi, 227.

Isthmocoris McAtee.

piceus Say. Compl. Writ., i, 336.

Phlegyas Stål.

abbreviatus Uhler. *Peliopelta. Phygadicus.* Bull. Geol. Geog. Surv. Terr., ii, 313.

Œdancala Amyot and Serville.

dorsalis Say. Compl. Writ., i, 335.

Crophius Stål.

disconotus Say. Compl. Writ., i, 330.

Myodocha Latreille.

serripes Olivier. Insect Book, Pl. xxix, 23.

Heræus Stål.

plebejus Stål. Enum. Hemip., iv, 147.

Ligyrocoris Stål.

diffusus Uhler. Proc. Bos. Soc. Nat. Hist., xiv, 101.

Perigenes Distant.

constrictus Say. *fallax* Heidemann. Compl. Writ., i, 332.
costalis Van Duzee. Can. Ent., xli, 373.

Orthæa Dallas.

basalis Dallas. List. Hemip., ii, 575.

Ptochiomera Say.

clavigera Uhler. Hemip. Col., 24.

Cnemodus Herrich-Schæffer.

mavortius Say. Compl. Writ., i. 337.

Pseudocnemodus Barber.

canadensis Provancher. *bruneri* Barber. Jour. N. Y. Ent. Soc., xix, 26.

Ozophora Uhler.

picturata Uhler. Proc. Bost. Soc. Nat. Hist., xiv, 102.

Rhyparochromus Curtis.

plenus Distant. Biol. Centr. Amer., Heterop., i, 216.

Sphragisticus Stål.

nebulosus Fallen. *Trapezonotus*. List. Hemip., ii, 564.

Aphanus Distant.

plenus Distant. Biol. Centr. Amer., Heterop., i, 409.

Emblethis Fieber.

vicarius Horvath. Ann. Mus. Nat. Hung., vi, 563.

Eremocoris Fieber.

ferus Say. *Pamera*. Compl. Writ., i, 333.

Xestocoris Van Duzee.

nitens Van Duzee. Ent. News, xvii, 390.

Cryphula Stål.

parallelogramma Stål. Enum. Hemip., iv, 165.

Scolopostethus Fieber.

atlanticus Horvath. Rev. d'Entom., xii, 239.
thomsoni Reuter. Ann. Soc. Ent. Fr., Ser. 5, ii, 562.

Family NEIDIDÆ.

Neides Latreille.

muticus Say. Compl. Writ., i, 328.

Jalysus Stål.

spinosus Say. *Berytus.* Compl. Writ., i, 28.

Family ARADIDÆ.

Aradus Fabricius.

abbas Bergroth. Bull. Soc. Ent. Belg., 1889. clxxx.
falleni Stål. Enum. Hemip., iii, 136. (M.P.Z.)
quadrilineatus Say. Compl. Writ., ii, 249.
robustus Uhler. Proc. Bos. Soc. Nat. Hist., xiv, 104.
similis Say. Compl. Writ., i, 351.

Aneurus Curtis.

fiskei Heidemann. Proc. Wash. Ent. Soc., vi, 164. (E.L.D.)
inconstans Uhler. Proc. Bost. Soc. Nat. Hist., xiv, 105.

Family COREIDÆ.

Merocoris Perty.

Corynocoris Mayr.

typhæus Fabricius var. **distinctus** Dallas. Ent. Syst., Suppl. 537; List. Hemip., ii, 419. (L.B.W.)

Acanthocephala Laporte.

terminalis Dallas. *Metapodius.* Insect Book, Pl. xxxi, 19; Bull. Geol. Geog. Surv. Terr., ii, (5) 298.

Euthochtha Mayr.

galeator Fabricius. *Acanthocerus.* Insect Book, Pl. xxxi, 31; Syst Rhyng., 191.

Anasa Amyot and Serville.

armigera Say. Compl. Writ., ii, 244.
repetita Heidemann. Proc. Wash. Ent. Soc., vii, 11.
tristis DeGeer. Squash bug. Rept. Conn. Agr. Expt. Sta., 1908, 811; 1919, 44.

Family ALYDIDÆ.

Protenor Stål.

belfragei Haglund. Stett. Ent. Zeit., 1868, 162.

Megalotomus Fieber.

quinquespinosus Say. *Lygæus.* Insect Book, Pl. xxxi, 25; Compl. Writ., ii, 247.

Alydus Fabricius.

eurinus Say. *Lygæus.* Insect Book, Pl. xxxi, 24; Compl. Writ., ii, 247.

pilosulus Herrich-Schæffer. *Ibid.,* Pl. xxix, ii; Proc. U. S. Nat. Mus., xvi, 50.

Family CORIZIDÆ.

Harmostes Burmeister.

reflexulus Say. Insect Book, Pl. xxix, 14; Compl. Writ., i, 323.

Corizus Fallen.

lateralis Say. Ann. Ent. Soc. Am., i, 140.

bohemani Signoret. ***nigristernum.*** *Ibid.,* i, 143.

Family PENTATOMIDÆ.

Podops Laporte.

cinctipes Say. Trans. Am. Ent. Soc., xxx, 22.

Brochymena Amyot and Serville.

carolinensis Westwood, *annulata* Fabricius. Trans. Am. Ent. Soc., xxx, 27.

arborea Say. *Ibid.,* xxx, 27.

quadripustulata Fabricius. *Ibid.,* xxx, 28.

Peribalus Mulsant and Rey.

limbolarius Stål. *Holcostethus.* Trans. Am. Ent. Soc., xxx, 32.

Trichopepla Stål.

semivittata Say. Insect Book, Pl. xxx, 6; Trans. Am. Ent. Soc., xxx, 34.

Rhytidolomia Stål.

saucia Say. *Liodcrma.* Trans. Am. Ent. Soc., xxx, 36.
senilis Say. *Liodcrma. Ibid.*, xxx, 37.

Chlorochroa Stål.

uhleri Stål. *persimilis* Horvath. *Pentatoma juniperina. Liodcrma.* Trans. Am. Ent. Soc., xxx, 39.

Mormidea Amyot and Serville.

lugens Fabricius. Insect Book, Pl. xxxi, 3; Stett. Ent. Zeit. xxiii, 103.

Solubea Bergroth.

pugnax Fabricius. *Œbalus.* Enum. Hemip., ii, 22.

Euschistus Dallas.

euschistoides Vollenhoven. *fissilis* Uhler. Trans. Am. Ent. Soc., xxx, 44.
ictericus Linnæus. *Ibid.*, xxx, 47.
tristigmus Say. *Ibid.*, xxx, 47.
variolarius Beauvois. Spined tobacco bug. Rept. Conn. Agr. Expt. Sta., 1906, 274.

Cœnus Dallas.

delius Say. Insect Book, Pl. xxx, 11; Compl. Writ., i, 320.

Hymenarcys Amyot and Serville.

nervosa Say. *Pentatoma.* Compl. Writ., i, 321.

Neottiglossa Kirby.

undata Say. Trans. Am. Ent. Soc., xxx, 50.

Cosmopepla Stål.

bimaculata Thomas. *carnifex* Fabricius. Insect Book, Pl. xxxi, 6.

Menecles Stål.

insertus Say. *Pentatoma.* Compl. Writ., i, 317.

Thyanta Stål.

calceata Say. *Pentatoma.* Compl. Writ., i, 320.
custator Fabricius. Insect Book, Pl. xxx, fig. 17.

Murgantia Stål.

histrionica Hahn. Harlequin cabbage bug. Bur. Ent., Circ. 103. (H.L.J.)

Acrosternum Fieber.

hilare Say. Insect Book, Pl. xxxi, 10; Trans. Am. Ent. Soc., xxx, 58.
pennsylvanicum DeGeer. *Ibid.*, xxx, 57.

Banasa Stål.

calva Say. Insect Book, Pl. xxx, 30; Trans. Am. Ent. Soc., xxx, 59.
dimidiata Say. *Ibid.*, xxx, 59.

Dendrocoris Bergroth.

humeralis Uhler. *Liotropis*. Bull. Geol. Geog. Surv., xxx, 400.

Meadorus Mulsant and Rey.

lateralis Say. *Elasmucha*. Trans. Am. Ent. Soc., xxx, 73.

Elasmostethus Fieber.

cruciatus Say. *borealis* Westwood. Compl. Writ., i, 311. (L.B.W.)

Stiretrus Laporte.

anchorago Fabricius. Spec. Ins., ii, 341.

Perillus Stål.

circumcinctus Stål. Trans. Am. Ent. Soc., xxx, 67.
exaptus Say. *Ibid.*, xxx, 65.

Mineus Stål.

strigipes Herrich-Schæffer. Trans. Am. Ent. Soc., xxx, 67.

Apateticus Dallas.

bracteatus Fitch. *Podisus*. Trans. Am. Ent. Soc., xxx, 70.
cynicus Say. *Podisus*. *Ibid.*, xxx, 68.

Podisus Herrich-Schæffer.

maculiventris Say. *spinosus*. Spined soldier bug. Rept. Conn. Agr. Expt. Sta., 1908, Pl. lv, d.
modestus Dallas. Trans. Am. Ent. Soc., xxx, 71.
placidus Uhler. *Ibid.*, xxx, 71.
serieventris Uhler. *Ibid.*, xxx, 71.

Family CYDNIDÆ.

Thyreocoris Schrank.

ater Amyot and Serville. *Corimelæna unicolor* Beauvois. Trans. Am. Ent., Soc., xxx, 4.
lateralis Fabricius. *gilletti. Corimelæna. Ibid.*, xxx, 7.
nitiduloides Wolff. *Corimelæna. Ibid.*, xxx, 5.
pulicarius Germar. *Corimelæna. Ibid.*, xxx, 9.

Amnestus Dallas.

pallidus Zimmer. Can. Ent., xlii, 166.
pusillus Uhler. *subferrugineus.* Trans. Am. Ent. Soc., xxx, 25. (H.L.V.)
spinifrons Say. *Ibid.*, xxx, 25.

Sehirus Amyot and Serville.

cinctus Beauvois. *Canthophorus.* Bull. Geol. Geog. Surv., Terr. iii, 397.

Family SCUTELLERIDÆ.

Homæmus Dallas.

æneifrons Say. Trans. Am. Ent. Soc., xxx, 13.

Eurygaster Laporte.

alternata Say. Trans. Am. Ent. Soc., xxx, 18.

Order **LEPIDOPTERA.**

Butterflies and Moths.

Suborder **HETEROCERA.**
Moths.

Family MICROPTERYGIDÆ.

Eriocephala Curtis.

griseocapitella Walsingham. Ent. Rec., x, 161.

Family HEPIALIDÆ.

Sthenopis Packard.

argenteomaculatus Harris. Silver-spotted ghost moth. Moth Book, 443.
quadriguttatus Grote. Proc. Phila. Ent. Soc., iii, 73; Moth Book, 443.

Family TINEIDÆ.

Pseudanaphora Walsingham.

arcanella Clemens. Proc. Acad. Nat. Sci. Phila., 1859, 262.

Acrolophus Poey.

plumifrontellus Clemens. Proc. Acad. Nat. Sci. Phila., 1859, 261; Moth Book, 443.

Pronuba Riley.

yuccasella Riley. Rept. Ins. Mo., v, 150; Ins. Life, iv, 360; Moth Book, 441.

Pitys Chambers.

fasciella Chambers. Can. Ent., v, iii. (C.R.E.)
miscecristatella Chambers. *Ibid.*, v, iii. (C.R.E.)

Hybroma Clemens.

servulella Clemens. Proc. Phila. Ent. Soc., i, 137. (C.R.E.)

Cyane Chambers.

visaliella Chambers. Can. Ent., v, 113. (C.R.E.)

Amadrya Clemens.

effrenatella Clemens. Proc. Acad. Nat. Sci. Phila., 1859, 260.
confusella Dietz. Trans. Am. Ent. Soc., xxxi, 8. (C.R.E.)

Homosetia Clemens.

costisignella Clemens. Trans. Am. Ent. Soc., xxxi, 83. (C.R.E.)

Tinea Linnæus.

acapnopennella Clemens. Trans. Am. Ent. Soc., xxxi, 63.
arcella Fabricius. *Ibid.*, xxxi, 62.
biflavimaculella Clemens. *Ibid.*, x, 170. (C.R.E.)
carnariella Clemens. Proc. Acad. Nat. Sci. Phila., 1859, 256. (C.R.E.)
dorsistrigella Clemens. *subjunctella*. *Ibid.*, 1859, 257.
fuscipunctella Haworth. *frigidella*. Trans. Am. Ent. Soc., x, 171. (C.R.E.)
granella Linnæus. *variatella*. *Ibid.*, x, 171.
marginistrigella Chambers. Can. Ent., v, 88. (C.R.E.)
obscurostrigella Chambers. *Ibid.*, vi, 232. (C.R.E.)
pellionella Linnæus. Fur moth. Trans. Am. Ent. Soc., xxxi, 51: Moth Book, 433. (C.R.E.)
rileyi Dietz. Trans. Am. Ent. Soc., xxxi, 59.

Monopsis Hübner.

ferruginella Hübner. *crocicapitella*. Trans. Am. Ent. Soc., x, 1, 170; xxxi, 33.

Tineola Herrich-Schæffer.

bisselliella Hummel. Clothes moth. Bur. Ent., Bull. 4, new ser., 66: Moth Book, 432.

Xylestia Clemens.

pruniramiella Clemens. Proc. Acad. Nat. Sci. Phila., 1859, 257. (C.R.E.)

Scardia Treitschke.

approximatella Dietz. Trans. Am. Ent. Soc., xxxi, 27.

Acrolepia Curtis.

incertella Chambers. *dorsimaculella*. Can. Ent., v, 174. (C.R.E.)

Argyresthia Hübner.

andereggiella Duponchel. *oreasella*. Tin. N. A., 93.
annettella Busck. Proc. U. S. Nat. Mus., xxxii, 12.
austerella Zeller. *undulatella* Chambers. *Ibid.*, xxxii, 22.
freyella Walsingham. *Ibid.*, xxxii, 11. (C.R.E.)
gœdartella Linnæus. *Ibid.*, xxxii, 12. (C.R.E.)

Swammerdamia Hübner.

castanæ Busck. Proc. Wash. Ent. Soc., xvi, 148. (C.R.E.)

Tischeria Zeller.

citrinipennella Clemens. Tin. N. A., 39. (C.R.E.)
malifoliella Clemens. Apple leaf-miner. Can. Ent., iii, 208; Storrs Agr. Expt. Sta., Bull. 45.
solidaginifoliella Clemens. Tin. N. A., 81. (C.R.E.)

Lyonetia Hübner.

sp. (several species probably synonymous.)

Philonome Chambers.

clemensella Chambers. Can. Ent., vi, 97. (C.R.E.)

Proleucoptera Busck.

albella Chambers. Can. Ent., iii, 23. (C.R.E.)

Marmara Clemens.

elotella Busck. Jour. Econ. Ent., 10, 488.
salictella Clemens. Proc. Phila. Ent. Soc., ii, 7. (C.R.E.)

Leucanthiza Clemens.

amphicarpeæfoliella Clemens. Tin. N. A., 85. (C.R.E.)

Ornix Treitschke.

cratægifoliella Clemens. Can. Ent., v, 48: Trans. Am. Ent. Soc., xxxiii, 292. (C.R.E.)
kalmiella Dietz. Trans. Am. Ent. Soc., xxxiii, 291. (C.R.E.)
obliterella Dietz. *Ibid.*, xxxiii, 297. (C.R.E.)
præciosella Dietz. *Ibid.*, xxxiii, 291. (C.R.E.)
prunivorella Chambers. *Ibid.*, xxxiii, 294. (C.R.E.)
quadripunctella Clemens. Tin. N. A., 177. (C.R.E.)

Gracillaria Haworth.

alchimiella Scopoli. *superbifrontella*. Trans. Am. Ent. Soc., x, 191.

belfrageella Chambers. Can. Ent., vii, 92. (C.R.E.)
bimaculatella Ely. Insec. Insc. Menst., iii, 53. (C.R.E.)
blandella Clemens. Tin. N. A., 257. (C.R.E.)
burgessiella Zeller. Insec. Insc. Menst., iii, 51. (C.R.E.)
cornusella Ely. *Ibid.*, iii, 53. (C.R.E.)
coroniella Clemens. Tin. N. A., 243, (C.R.E.)
elongella Linnæus. Trans. Am. Ent. Soc., x, 193. (C.R.E.)
fasciella Chambers. *Ibid.*, x, 201. (C.R.E.)
flavella Ely. Insec. Insc. Menst., iii, 56. (C.R.E.)
flavimaculella Ely. *Ibid.*, iii, 57. (C.R.E.)
fraxinella Ely. *Ibid.*, iii, 58. (C.R.E.)
fulgidella Clemens. Tin. N. A., 92. (C.R.E.)
glutinella Ely. Insec. Insc. Menst., iii, 55. (C.R.E.)
juglandiella Chambers. Can. Ent., vii, 9. (C.R.E.)
lespedezæfoliella Clemens. *robiniella.* Tin. N. A., 144, 207. (C.R.E.)
minimella Ely. Insec. Insc. Menst., iii, 58. (C.R.E.)
ostryæella Chambers. Ent. News, xxiii, 167. (C.R.E.)
packardella Chambers. Can. Ent., iv, 27. (C.R.E.)
pennsylvaniella Engel. Ent. News, xviii, 276. (C.R.E.)
purpuriella Chambers. Can. Ent., ix, 126. (C.R.E.)
quercinigrella Ely. Insec. Insc. Menst., iii, 60. (C.R.E.)
rhoifoliella Chambers. Can. Ent., viii, 31. (C.R.E.)
sassafrasella Chambers. *Ibid.*, viii, 33. (C.R.E.)
serotinella Ely. *Coriscium.* Ent. News, xix, 57. (C.R.E.)
stigmatella Fabricius. Can. Ent. xi, 74. (C.R.E.)
strigifinitella Clemens. Tin. N. A., 92. (C.R.E.)
venustella Clemens. *eupatoriella.* *Ibid.*, 92. (C.R.E.)
violacella Clemens. *desmodifoliella.* *Ibid.*, 93, 268. (C.R.E.)

Lithocolletes Hübner.

aceriella Clemens. Tin. N. A., 65. (C.R.E.)
argentifimbriella Clemens. Trans. Am. Ent. Soc., xxxiv, 281. (C.R.E.)
basistrigella Clemens. *Ibid.*, xxxiv, 308. (C.R.E.)
bethuniella Chambers. Can. Ent., iii, 109. (C.R.E.)
betulivora Walsingham. Ins. Life, iii, 326. (C.R.E.)
caryæalbella Chambers. Can. Ent., iii, 58. (C.R.E.)
caryæfoliella Clemens. Tin. N. A., 65. (C.R.E.)

cincinnatiella Chambers. Trans. Am. Ent. Soc., xxxiv, 329. (C.R.E.)
corylisella Chambers. *Ibid.*, xxxiv, 344. (C.R.E.)
cratægella Clemens. Tin. N. A., 76. (C.R.E.)
desmodiella Clemens. *Ibid.*, 68. (C.R.E.)
fitchiella Clemens. *Ibid.*, 139. (C.R.E.)
guttifinitella Clemens. *Ibid.*, 65. (C.R.E.)
hamadryella Clemens. White oak blotch leaf miner. Can. Ent., iii, 55.
lentella Braun. Trans. Am. Ent. Soc., xxxiv, 326. (C.R.E.)
lucidicostella Clemens. *Ibid.*, xxxiv, 281. (C.R.E.)
nemoris Walsingham. Ins. Life, ii, 116. (C.R.E.)
ostryarella Chambers. Can. Ent., iii, 111. (C.R.E.)
picturatella Braun. Ent. News, xxvii, 84. (C.R.E.)
saccharella Braun. Trans. Am. Ent. Soc., xxxiv, 327. (C.R.E.)
salicifoliella Clemens. Tin. N. A., 169. (C.R.E.)
ulmella Chambers. Can. Ent., iii, 148. (C.R.E.)

Bucculatrix Zeller.

canadensisella Chambers. Birch leaf skeletonizer. Rept. Conn. Agr. Expt. Sta., 1909-10, 701.
magnella Chambers. Can. Ent., vii, 54. (C.R.E.)
nivella Chambers. *Ibid.*, vii, 54. (C.R.E.)
pomifoliella Clemens. Apple Bucculatrix. Ribbed cocoon-maker. Cornell Agr. Expt. Sta., Bull. 214: Moth Book, 431.
sp.

Opostega Zeller.

bosqueella Chambers. Bull. Geol. Geog. Surv. Terr., iv, 106. (C.R.E.)
magnella Chambers. Can. Ent., vii, 54. (C.R.E.)
niveella Chambers. *Ibid.*, vii, 54. (C.R.E.)
quadristrigella Chambers. Cin. Quart. Jour. Sci., ii, 106. (C.R.E.)

Trifurcula Zeller.

obrutella Zeller. Verh. Zool.-Bot. Ges. Wien., xxiii, 316. (C.R.E.)

Nepticula Von Heyden.

amelanchierella Clemens. Tin. N. A., 174. (C.R.E.)
virginiella Clemens. *Ibid.*, 172. (C.R.E.)
sp.

Family ELACHISTIDÆ.

Walshia Clemens.

amorphella Clemens. Tin. N. A., 241. (C.R.E.)

Mompha Hübner.

cephalonthiella Chambers. Can. Ent., iii, 221. (C.R.E.)
eloisella Clemens. Tin. N. A., 131.

Stagmatophora Herrich-Schæffer.

ceanothiella Cosens. Can. Ent., xl, 107.
sexnotella Chambers. Jour. N. Y. Ent. Soc., x, 97.
sp.

Psacaphora Herrich-Schæffer.

passerella Busck. Proc. Wash. Ent. Soc., xi, 95. (C.R.E.)
sp.

Theisoa Chambers.

constrictella Zeller. *bifasciella.* Can. Ent., vi, 76. (C.R.E.)

Stilbosis Clemens.

tesquella Clemens. Tin. N. A., 129. (C.R.E.)

Antispila Hübner.

cornifoliella Clemens. Tin. N. A., 103. (C.R.E.)

Scythris Hübner.

albapennella Chambers. Can. Ent. vii, 11.
eboracensis Zeller. Linn. Ent., x, 205.

Lymnæcia Stainton.

phragmitiella Stainton. Cat. Brit. Tin., Suppl., 4, 1851.

Elachista Treitschke.

albapalpella Chambers. Jour. Cin. Soc. Nat. Hist., viii, 240. (C.R.E.)
curvilineella Chambers. Can. Ent., iv, 172. (C.R.E.)
sp.

Erineda Busck.

elyella Busck. Proc. Wash. Ent. Soc., xi, 94. (C.R.E.)

Cosmopteryx Hübner.

gemmiferella Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 10.

Batrachetra Stainton.

trichella Busck. Can. Ent., xl, 196. (C.R.E.)

Coleophora Hübner.

cratipennella Clemens. Proc. Phila. Ent. Soc., iii, 506. (C.R.E.)
fletcherella Fernald. Can. Ent., iv, 122.
laricella Hübner. Ins. Aff. Park and Woodl. Trees, i, 170.
limosipennella Duponchel. *Ibid.*, i, 167.
spissicornis Haworth. *corruscipennella.* Tin. N. A., 88. (C.R.E.)
sp.

Family BLASTOBASIDÆ.

Holcocera Clemens.

chalcofrontella Clemens. Proc. Phila. Ent. Soc., ii, 122. (C.R.E.)
elyella Dietz. Trans. Am. Ent. Soc., xxxvi, 49. (C.R.E.)
melanostriatella Dietz. *Ibid.*, xxxvi, 66. (C.R.E.)

Valentina Walsingham.

modestella Clemens. *glandulella.* Trans. Am. Ent. Soc., xxxvi, 33. (C.R.E.)

Pseudopigritia Dietz.

equitella Dietz. Trans. Am. Ent. Soc., xxvii, 112.

Pigritia Clemens.

laticapitella Clemens. Trans. Am. Ent. Soc., xxvii, 106.
ornatella Dietz. *Ibid.*, xxvii, 107. (C.R.E.)
sp.

Family ŒCOPHORIDÆ.

Borkhausenia Hübner.

ascriptella Busck. Can. Ent., xl, 194.
shalleriella Chambers. *Œcophora.* Cin. Quart. Jour. Sci., ii, 114.

Decantha Busck.

borkhauseni Zeller. Verh. Zool-Bot. Ges. Wien., xxiii, 290. (C.R.E.)

Œcophora Latreille.

newmanella Clemens. *Dasycera.* Tin. N. A., 252.

Gerdana Busck.

caritella Busck. Pros. U. S. Nat. Mus., xxxv, 193. (C.R.E.)

Epicallima Dyar.

argenticinctella Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 167.

Euclemensia Grote.

bassettella Clemens. Proc. Phila. Ent. Soc., ii, 423: Rept. Conn. Agr. Expt. Sta., 1916, 143.

Semioscopsis Hübner.

allenella Walsingham. Trans. Am. Ent. Soc., x, 174. (C.R.E.)

Depressaria Haworth.

atrodorsella Clemens. Proc. Acad. Nat. Sci. Phila., ii, 124.
betulella Busck. Proc. U. S. Nat. Mus., xxiv, 746. (C.R.E.)
fernaldella Walsingham. Ins. Life, i, 256.
gracilis Walsingham. *Ibid.*, i, 257. (C.R.E.)
heracliana DeGeer. *ontariella.* Can. Ent., ii, 3, 19. (C.R.E.)
pulvipennella Clemens. Proc. Phila. Ent. Soc., ii, 421.
robiniella Packard. Pack. Guide, 349.
sp. near **pallidella** Busck.

Cryptolechia Zeller.

tentoriferella Clemens. *Machima.* Tin. N. A., 148. (C.R.E.)

Psilocorsis Clemens.

quercicella Clemens. Tin. N. A. 149. (C.R.E.)

Agnopteryx Hübner.

flavicomella Engel. Ent. News, xviii, 276. (C.R.E.)
lecontella Clemens. Tin. N. A., 137.
fernaldella Walsingham. *walsinghamiella* Busck. Ins. Life, i, 256.

Family XYLORICTIDÆ.

Brachyloma Clemens.

querciella Busck. Proc. Wash. Ent. Soc., x, 112. (C.R.E.)

Stenoma Zeller.

leucillana Zeller; Ins. Life, ii, 153.
schlægeri Zeller. *Ibid.*, ii, 152.

Family GELECHIIDÆ.

Gelechia Hübner.

argentipunctella Ely. Proc. Wash. Ent. Soc., xii, 70. (C.R.E.)
conclusella Walker. *crescentifasciella.* Can. Ent., vi, 237. (C.R.E.)
disco-ocellella Chambers. *Ibid.*, iv, 194. (C.R.E.)
fluvialella Busck. *Ibid.*, xl, 194. (C.R.E.)
hibiscella Busck. Proc. U. S. Nat. Mus., xxv, 869. (C.R.E.)
maculimarginella Chambers. Can. Ent., vi, 241. (C.R.E.)
mediofuscella Clemens. Proc. Phila. Ent. Soc., ii, 11, 120.
nigrimaculella Busck. Proc. U. S. Nat. Mus., xxv, 880. (C.R.E.)
pseudoacaciella Chambers. Can. Ent., iv, 107.
pseudofondella Busck. Proc. Wash. Ent. Soc., ix, 87. (C.R.E.)
rileyella Chambers. Can. Ent., iv, 106. (C.R.E.)
trialbamaculella Chambers. Cin. Quart. Jour. Sci., ii, 250. (C.R.E.)
vernella Murtfeldt. *formosella.* Can. Ent., xiii, 243. (C.R.E.)

Anacampsis Curtis.

innocuella Zeller. Proc. U. S. Nat. Mus., xxv, 845. (C.R.E.)
rhoifructella Clemens. Can. Ent., iii. 68. (C.R.E.)
tristrigella Walsingham. Trans. Am. Ent. Soc., x, 181.

Dichomeris Hübner.

herculella Busck. Proc. Wash. Ent. Soc., xi, 89. (C.R.E.)
marginellus Fabricius. Juniper webworm. Rept. N. Y. State Ent., 26, 35: Rept. Conn. Agr. Expt. Sta., 1915, 137.

Aproærema Durrant.

nigratomella Clemens. *apicilinella.* Proc. Phila. Ent. Soc., ii, 11, 120. (C.R.E.)

Anarsia Zeller.

lineatella Zeller. Peach twig borer. Rept. Conn. Agr. Expt. Sta., 1918, 306.

Ypsolophus Fabricius.

bipunctellus Walsingham. Trans. Am. Ent. Soc., x, 186. (C.R.E.)
ligulellus Hübner. *reedella.* Can. Ent. iv, 222.
ventrellus Fitch. Trans. N. Y. Agr. Soc., xiii, 254. (C.R.E.)

Anorthosia Clemens.

punctipennella Clemens. Can. Ent., iv, 225. (C.R.E.)

Glyphidocera Walsingham.

speratella Busck. Proc. Wash. Ent. Soc., ix, 88. (C.R.E.,

Trichotaphe Clemens.

alacella Clemens. Proc. Phila. Ent. Soc., i, 132. (C.R.E.)
flavocostella Clemens. *Ibid.,* i, 131.
inversella Zeller. Can. Ent., x, 54. (C.R.E.)
juncidella Clemens. *dubitella. Ibid.,* iv, 92. (C.R.E.)
serrativittella Zeller. *Ibid.,* ix, 24. (C.R.E.)
setosella Clemens. *costolutella. Ibid.,* iv, 209. (C.R.E.)
trimaculella Chambers. *Ibid.,* vi, 238. (C.R.E.)
trinotella Busck. *Ibid.,* xxxviii, 122. (C.R.E.)

Polyhymno Chambers.

luteostrigella Chambers. Can. Ent., vi, 247. (C.R.E.)

Gnorimoschema Busck.

artemisiella Kearfott. Jour. N. Y. Ent. Soc., xi, 160. (C.R.E.)
banksiella Busck. Proc. U. S. Nat. Mus., xxv, 832. (C.R.E.)
gallæasteriella Kellicott. Can. Ent., x, 203. (C.R.E.)
gallæsolidaginis Riley. Rept. Ins. Mo., i, 173.
saphirinella Chambers. Cin. Quart. Jour. Sci., ii, 250. (C.R.E.)

Trypanisma Clemens.

prudens Clemens. Tin. N. A., 125. (C.R.E.)

Epithectis Meyrick.

attributella Walker. *difficilisella.* Can. Ent., iv, 66.

Recurvaria Haworth.

apicitripunctella Clemens. Trans. Am. Ent. Soc., x, 182. (C.R.E.)

obliquestrigella Chambers. Can. Ent., iv, 65. (C.R.E.)

Aristotelia Hübner.

absconditella Walker. Trans. Am. Ent. Soc., x, 181. (C.R.E.)

fungivorella Clemens. Proc. Phila. Ent. Soc., iii, 507. (C.R.E.)

minimella Chambers. Can. Ent., vi, 243. (C.R.E.)

pudibundella Zeller. *intermediella.* Verh. Zool.-Bot. Ges. Wien., xxiii, 273. (C.R.E.)

quinquepunctella Busck. Proc. U. S. Nat. Mus., xxv, 804. (C.R.E.)

roseosuffusella Clemens. Proc. Phila. Ent. Soc., ii, 121.

rubidella Clemens. *Ibid.*, ii, 121. (C.R.E.)

Telphusa Chambers.

glandiferella Zeller. *sella.* Can. Ent., vi, 238. (C.R.E.)

latifasciella Chambers. Cin. Quart. Jour. Sci., ii, 251.

palliderosacella Chambers. Bull. Geol. Geog. Surv. Terr., iv, 90.

Sitotroga Heinemann.

cerealella Olivier. Angoumois grain moth. N. J. Agr. Expt. Sta., Bull. 147.

Paltodora Meyrick.

anteliella Busck. Proc. U. S. Nat. Mus., xxv, 778. (C.R.E.)

cilialineella Chambers. Can. Ent., vi., 242. (C.R.E.)

similiella Chambers. *Ibid.*, iv, 193. (C.R.E.)

Ptyocerata Ely.

busckella Ely. Proc. Wash. Ent. Soc., xii, 69. (C.R.E.)

Metzneria Zeller.

lappella Linnæus. Syst. Nat., 1758, 537.

Family YPONOMEUTIDÆ.

Yponomeuta Latreille.

multipunctella Clemens. Tin. N. A., 95. (C.R.E.)

Martyringa Busck.

latipennis Walsingham. Trans. Am. Ent. Soc., x, 190. (C.R.E.)

Harpipteryx Hübner.

xylostella Linnæus. Contr. Nat. Hist. Lepidop, iv, 246, pl. xxviii, fig. 12.

Plutella Schrank.

maculipennis Curtis. *cruciferarum. dubiosella.* Brit. Ent., 1832, pl. 420: Can. Ent., xxi, 27. (C.R.E.)

Choreutis Hübner.

inflatella Clemens. Proc. Phila. Ent. Soc., ii, 5.

Family TORTRICIDÆ.

Evetria Hübner.

comstockiana Fernald. Can. Ent., xi, 157.

Polychrosis Ragonot.

vernoniana Kearfott. Trans. Am. Ent. Soc., xxxiii, 7. (C.R.E.)

viteana Clemens. Grape berry moth. Cornell Agr. Expt. Sta., Bull. 223.

sp.

Bactra Stephens.

lanceolana Hübner. Schmett. Eur. Tort., f. 80. 1800. (C.R.E.)

Exartema Clemens.

concinnanum Clemens. Proc. Phila. Ent. Soc., v, 134. (C.R.E.)

fasciatanum Clemens. *Ibid.*, v, 134.

inornatanum Clemens. Proc. Phila. Ent. Soc., v, 134.

olivaceanum Fernald. Trans. Am. Ent. Soc., x, 71.

permundanum Clemens. Proc. Phila. Ent. Soc., v, 134.

punctanum Walsingham. Ill. Lep. Het. Brit. Mus., iv, 87. (C.R.E.)

sericoranum Walsingham. *Ibid.*, iv, 36.

versicoloranum Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 357. (C.R.E.)

zellerianum Fernald. *nitidanum.* Verh. Zool-Bot. Ges. Wein., xxv, 270. (C.R.E.)

Olethreutes Hübner.*

abietana Fernald. Can. Ent., xl, 349.
agilana Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 359. (C.R.E.)
bipartitana Clemens. *Ibid.,* 1860. 346.
campestrana Zeller. Verh. Zool-Bot. Ges. Wien., xxv. 282.
corruscana Clemens. Proc. Phila. Acad. Sci., 1860. 346.
cyanana Murtfeldt. Am. Ent., iii. 14.
dimidiana Sodoffsky. Bull. Mosc., 1830. 73. (C.R.E.)
griseoalbana Walsingham. Ill. Lep. Het., Brit. Mus., iv. 38. (C.R.E.)
hartmanniana Linnæus. Faun. Suec. 345. (C.R.E.)
hartmanniana var. **albeolana** Zeller. Verh. Zool-Bot. Ges. Wien., xxv. 262.
hebesana Walker. Ill. Lep. Het., Brit Mus., iv. 31.
impudens Walsingham. Trans. Ent. Soc. Lond., 1884. 135 (C.R.E.)
instrutana Clemens. Proc. Phila. Ent. Soc., v. 135. (C.R.E.)
interruptolineana Fernald. *Penthina.* Trans Am. Ent. Soc., x. 70. (C.R.E.)
nimbatana Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 346.
ochromediana Kearfott. Trans. Am. Ent. Soc., xxxiii. 11. (C.R.E.)
separatana Kearfott. *Ibid.* xxxiii. 13. (C.R.E.)
sp.

Pseudogalleria Ragonot.

inimicella Zeller. Verh. Zool-Bot. Ges. Wien., xxii. 559. (C.R.E.)

Eucosma Hübner.

abbreviatana Walsingham. Ill. Lep. Het., Brit. Mus., iv. 54.
agricolana Walsingham. *Ibid.* iv. 42. (C.R.E.)
albiguttana Zeller. Verh. Zool-Bot. Ges. Wien., xxv. 313. (C.R.E.)
boxcana Kearfott. Trans. Am. Ent. Soc., xxxiii. 87. (C.R.E.)
cataclystiana Walker. *Pædisca ochreana.* Proc. Phila. Ent. Soc., iii. 520.
confana Kearfott. Proc. U. S. Nat. Mus., xxviii. 355. (C.R.E.)
culminana Walsingham. Ill. Lep. Het., iv. 38.

* See also appendix.

dorsisignatana Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 353: Moth Book, 418.
fulminana Walsingham. Ill. Lep. Het., iv. 50. (C.R.E.)
gracilana Kearfott. Proc. U. S. Nat. Mus., xxviii. 352. (C.R.E.)
haracana Kearfott. *Proteopteryx*. Trans. Am. Ent. Soc., xxxiii. 46. (C.R.E.)
juncticiliana Walsingham. Ill. Lep. Het., iv. 75. (C.R.E.)
minutana Kearfott. Proc. U. S. Nat. Mus., xxviii. 356.
otiosana Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 354. (C.R.E.)
pergandeana Fernald. Can. Ent. xxxvii. 399. (C.R.E.)
perplexana Fernald. *Epiblema*. Jour. N. Y. Ent. Soc., ix. 51. (C.R.E.)
scudderiana Clemens. *Saligneana*. Proc. Phila. Ent. Soc., v. 141. (C.R.E.)
solicitana Walker. Cat. Brit. Mus., xxviii. 387. (C.R.E.)
strenuana Walker. Ill. Lep. Het., iv. 52.
tomonana Kearfott. Can. Ent., xxxix. 78. (C.R.E.)
transmissana Walker. Ill. Lep. Het., iv. 52.
zomonana Kearfott. Can. Ent., xxxix. 80. (C.R.E.)

Cydia Hübner.

cinereodorsana Kearfott. Trans. Am. Ent. Soc., xxxiii. 39. (C.R.E.)
raracana Kearfott. *Ibid.*, xxxiii. 44. (C.R.E.)

Thiodia Hübner.

essexana Kearfott. Trans. Am. Ent. Soc., xxxiii. 39. (C.R.E.)
formosana Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 360.
imbridana Fernald. Can. Ent., xxxvii. 400. (C.R.E.)
ochrotermenana Kearfott. *Ibid.*, xxxix. 57. (C.R.E.)
olivaceana Riley. Trans. St. Louis Acad. Sci., iv. 320. (C.R.E.)
signatana Clemens. Ins. Aff. Park and Woodl. trees, i, 168.
striatana Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 349.

Episimus Walsingham.

argutanus Clemens. Proc. Acad. Nat. Sci. Phila., 1860. 358. (C.R.E.)

Proteopteryx Walsingham.

bolliana Slingerland. Jour. N. Y. Ent. Soc., xvi, 173.
cressoniana Clemens. Proc. Phila. Ent. Soc., III. 514.

Epinotia Hübner.

crispana Clemens. Proc. Phila. Ent. Soc., v. 137.

fasciolana Clemens. *Ibid.*, III. 511. (C.R.E.)

illicifoliana Kearfott. Bull. Am. Mus. Nat. Hist., xxiii. 158. (C.R.E.)

saliciana Clemens. Proc. Phila. Ent. Soc., III. 515. (C.R.E.)

Tmetocera Lederer.

ocellana Schiffermüller. Bud moth. Rept. Conn. Agr. Expt. Sta., 1909-10. 353.

Eudemis Hübner.

vacciniana Packard. Black-headed cranberry worm. N. J. Agr. Expt. Sta., Spec. Bull. K. (C.R.E.)

Cenopis Zeller.

diluticostana Walsingham. *quercana.* Trans. Am. Ent. Soc., x, 69.

reticulatana Clemens. *Ibid.*, ii, 272. (C.R.E.)

testulana Zeller. Verh. Zool-Bot. Ges. Wien., xxv, 241. (C.R.E.)

Cœlostathma Clemens.

discopunctana Clemens. *Amphisa.* Proc. Acad. Nat. Sci. Phila., 1860, 355.

Sparganothis Hübner.

inconditana Walsingham. Ill. Lep. Het. Brit. Mus., iv, 16. (C.R.E.)

irrorea Robinson. Trans. Am. Ent. Soc., ii, 274.

xanthoides Walker. *breviornatana.* Proc. Phila. Ent. Soc., v, 140.

Archips Hübner.

argyrospila Walker. Cat. Brit. Mus., xxviii, 373: Moth Book, 422.

cerasivorana Fitch. Trans. Am. Ent. Soc., ii, 275: Moth Book, 422.

clemensiana Fernald. Can. Ent., xi, 155.

fervidana Clemens. *paludana.* Trans. Am. Ent. Soc., ii, 275. (C.R.E.)

infumatana Zeller. Verh. Zool-Bot. Ges. Wien., xxv, 216. (C.R.E.)

parallela Robinson. Trans. Am. Ent., Soc., ii, 267.

purpurana Clemens. Proc. Phila. Ent. Soc., v, 136: Moth Book, 422.

rileyana Grote. Trans. Am. Ent. Soc., ii, 121. (F.W.H.)
rosaceana Harris. Oblique banded leaf-roller. Jour. Econ. Ent. ii, 391: Moth Book, 422.
rosana Linnæus. Rept. Conn. Agr. Expt. Sta., 1913, 223.
semiferana Walker. *Tortrix flaccidana* Robinson. Trans. Am. Ent. Soc., ii, 277.
virescana Clemens. Proc. Phila. Ent. Soc., v, 140.

Ancylis Hübner.

angulifasciana Zeller. Verh. Zool-Bot. Ges. Wien., xxv, 256. (C.R.E.)
burgessiana Zeller. *Ibid.,* xxv, 252.
comptana Frölich. Strawberry leaf-roller. N. J. Agr. Expt. Sta., Bull. 149: Moth Book, 419.
diminutana Kearfott. Proc. U. S. Nat. Mus., xxviii, 361. (C.R.E.)
divisana Walker. Cat. Brit. Mus., xxviii, 385. (C.R.E.)
dubiana Clemens. Proc. Phila. Ent. Soc., iii, 512.
laciniana Zeller. Verh. Zool-Bot. Ges. Wien., xxv, 253.
muricana Walsingham. Ill. Lep. Het. iv, 74.
platanana Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 349. (C.R.E.)
pulchellana Clemens. Proc. Phila. Ent. Soc., iii, 511. (C.R.E.)
subæquana Zeller. Verh. Zool-Bot. Ges. Wien., xxv, 254. (C.R.E.)

Enarmonia Hübner.

americana Walsingham. Ill. Lep. Het. Brit. Mus., iv, 67.
caryana Fitch. N. Y. Agr. Rept., xvi, 459. (C.R.E.)
interstinctana Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 351.
prunivora Walsh. *Semasia.* Lesser apple worm. Rept. Ill. State Ent., i, 2d ed., 108.

Laspeyresia Hübner.

gallæsaliciana Riley. *Enarmonia.* Trans. St. Louis Acad. Sci., iv, 320. (C.R.E.)
molesta Busck. Oriental peach moth. Rept. Conn. Agr. Expt. Sta., 1918, 298.

Gymnandrosoma Dyar.

punctidiscanum Dyar. Proc. Wash. Ent. Soc., vi, 60.

Ecdytolopha Zeller.

insiticiana Zeller. Verh. Zool-Bot. Ges. Wien., xxv, 266.

Carpocapsa Treitschke.

pomonella Linnæus. *Cydia.* Codling-moth. Apple worm. Cornell Agr. Expt. Sta., Bull. 142; Moth Book, 419.

Phthinolophus Dyar.

indentanus Dyar. Proc. Wash. Ent. Soc., v, 307. (C.R.E.)

Acleris Hübner.

boscana Fabricius. Ent. Syst. Suppl., iii, 2, 269. (C.R.E.)
hastiana Linnæus. Trans. Am. Ent. Soc., ii, 280. (C.R.E.)
logiana Schiffermüller var. **viburnana** Clemens. *Ibid.,* ii, 281.
subnivana Walker. *deflectana.* *Ibid.,* ii, 283. (C.R.E.)
trisignana Robinson. *Ibid.,* ii, 282. (C.R.E.)

Peronea Curtis.

commandrana Fernald. Can. Ent., xxiv, 124. (C.R.E.)
ferrugana Schiffermüller. *gallicolana.* Proc. Phila. Ent. Soc., iii, 516. (C.R.E.)
heindelana Fernald. Am. Nat., xxxix, 170, 859, 873. (C.R.E.)
pulverosana Walker. Ill. Lep. Het. Brit. Mus., iv, 3. (C.R.E.)
trisignana Robinson. Trans. Am. Ent. Soc., ii, 282. (C.R.E.)
sp.

Epagoge Hübner.

sulfureana Clemens. Trans. Am. Ent. Soc., ii, 273.
virescana Clemens. Proc. Phila. Ent. Soc., v, 140.

Platynota Clemens.

flavedana Clemens. Trans. Am. Ent. Soc., ii, 278: Moth Book, 422.

Pandemis Hübner.

lamprosana Robinson. Trans. Am. Ent. Soc., ii, 264. (C.R.E.)
limitata Robinson. *Ibid.,* ii, 264.

Tortrix Linnæus.

albicomana Clemens. Proc. Phila. Ent. Soc., v, 137: Moth Book, 423.
fumiferana Clemens. *Ibid.,* v, 139.

nervosana Kearfott. Trans. Am. Ent. Soc., xxxiii, 71. (C.R.E.)
pallorana Robinson. *Ibid.*, ii, 266.
peritana Clemens. *Ibid.*, ii, 277. (C.R.E.)
quercifoliana Fitch. N. Y. Agr. Rept., 1858, 826.

Eulia Hübner.

alisellana Robinson. Trans. Am. Ent. Soc., ii, 267.
politana Haworth. Rept. U. S. Dept. Agr., 1880, 264. (C.R.E.)
quadrifasciana Fernald. Trans. Am. Ent. Soc., x, 67.
velutinana Walker. *triferana. incertana. lutosana.* Trans. Am. Ent. Soc., ii, 279.

Amorbia Clemens.

humerosana Clemens. Trans. Am. Ent. Soc., ii, 275: Moth Book, 423.

Phalonia Hübner.

angulatana Robinson. Trans. Am. Ent. Soc., ii, 286. (C.R.E.)
argentilimitana Robinson. *Ibid.*, ii, 287. (C.R.E.)
atmosana Busck. Jour. N. Y. Ent. Soc., xv, 22. (C.R.E.)
aurorana Kearfott. Trans. Am. Ent. Soc., xxxiii, 83. (C.R.E.)
biscana Kearfott. *Ibid.*, xxxiii, 75. (C.R.E.)
bunteana Robinson. *Ibid.*, ii, 288. (C.R.E.)
dorsimaculana Robinson. *Ibid.*, ii, 285.
hospes Walsingham. Trans. Ent. Soc. Lond., 1884, 131.
interruptofasciana Robinson. Trans. Am. Ent. Soc., ii, 287. (C.R.E.)
maiana Kearfott. *Ibid.*, xxxiii, 82. (C.R.E.)
marloffiana Busck. Jour. N. Y. Ent. Soc., xv, 26. (C.R.E.)
nonlavana Kearfott. Trans. Am. Ent. Soc., xxxiii, 85. (C.R.E.)
œnotherana Riley. Trans. St. Louis Acad. Sci., iv, 316.
rana Busck. Jour. N. Y. Ent. Soc., xv, 22. (C.R.E.)
temerana Busck. *Ibid.*, xv, 28. (C.R.E.)
winniana Kearfott. Can. Ent., xxxvii, 10. (C.R.E.)

Commophila Hübner.

contrastana Kearfott. Can. Ent., xxxix, 160.

Pharmacis Hübner.

sartana Hübner. Zutr. Exot. Schmett., ii, 111. (C.R.E.)

Hysterosia Stephens.

baracana Busck. Jour. N. Y. Ent. Soc., xv, 33. (C.R.E.)
terminana Busck. *Ibid.*, xv, 33. (C.R.E.)

Family PTEROPHORIDÆ.

Oxyptilus Zeller.

ningoris Walsingham. Pteroph. N. A., 20. (C.R.E.)
periscelidactylus Fitch. Grape plume moth. *Ibid.*, 17.
tenuidactylus Fitch. *Ibid.*, 20.

Platyptilia Hübner.

cosmodactyla Hübner. Pteroph. N. A., 25.
marginidactyla Fitch. *Ibid.*, 34.

Pterophorus Geoffroy.

cretidactylus Fitch. Pteroph. N. A., 52.
elliottii Fernald. Can. Ent., xxv, 95.
homodactylus Walker. Pteroph. N. A., 41.
inquinatus Zeller. *Ibid.*, 56. (C.R.E.)
paleaceus Zeller. *Ibid.*, 45.
sp.

Family PYRALIDÆ.

Glaphria Hübner.

fulminalis Lederer. Wien. Ent. Mon., vii, 487.
glaphyralis Guenée. *albolineata*. Trans. Am. Ent. Soc., i, 28.
invisalis Guenée. Spec. Gén., viii, 361. (C.R.E.)
sequistrialis Hübner. Zutr. Exot. Schmett., ii, 29. (C.R.E.)

Lipocosma Lederer.

fuliginosalis Fernald. Ent. Am., iv, 37.

Desmia Westwood.

funeralis Hübner. Schmett. Eur., f. 103, 1796: Moth Book, 392.
funeralis var. **subdivisalis** Grote. Can. Ent., iii, 126.

Diastictis Hübner.

argyralis Hübner. Zutr. exot. Schmett., i, 21.
argyralis var. **ventralis** Grote and Robinson. Trans. Am. Ent. Soc., i, 21. (C.R.E.)

Blepharomastix Lederer.

ranalis Guenée. *Botys gracilis*. Trans. Am. Ent. Soc., i, 25. (C.R.E.)

Pantographa Lederer.

limata Grote and Robinson. Can. Ent., xvi, 26: Moth Book, 393.

Diaphania Hübner.

hyalinata Linnæus. *Glyphodes*. Melon caterpillar. Rept. N. Y. State Ent., xi, 134: Moth Book, 394.

nitidalis Stoll. *Glyphodes*. Pickle worm. Rept. N. Y. State. Ent., xi, 126: Moth Book, 394. (A.H.Me.)

Evergestis Hübner.

simulatilis Grote. *brunneogrisea*. Ent. Am., ii, 171. (C.R.E.)

straminalis Hübner. Handb. Brit. Lep., 424.

Crocidophora Lederer.

tuberculalis Lederer. Wien. Ent. Mon., vii, 476. (C.R.E.)

Nomophila Hübner.

noctuella Denis and Schiffermüller. Can. Ent., xxv, 129.

Loxostege Hübner.

dasconalis Walker. Cat. Brit. Mus., xviii, 273.

helvialis Walker. *Ibid.*, xix, 981. (F.W.H.)

obliteralis Walker. Bur. Ent., Bull. 27, new ser., 102.

similalis Guenée. Spec. Gén., viii, 405.

Diasemia Hübner.

pisusalis Walker.

Tholeria Hübner.

reversalis Guenée. Spec. Gén., viii, 409. (F.W.H.)

Perispasta Zeller.

cæculalis Zeller. *immixtalis*. Can. Ent., xiii, 232.

Phlyctænia Hübner.

acutella Walker. Cat. Brit. Mus., xxxv, 1753.

ferrugalis Hübner. *rubigalis*. Greenhouse leaf-tyer. Rept. Conn. Agr. Expt. Sta., 1909-10, 369.

terrealis Treitschke. Schm. Eur., vii, 110.

tertialis Guenée. *plectilis*. Trans. Am. Ent. Soc., i, 27: Moth Book, 397.

Cindaphia Lederer.

bicoloralis Guenée. Spec. Gén., viii, 205: Moth Book, 397.

Pyrausta Schrank.

ainsliei Heinrich. Rept. Conn. Agr. Expt. Sta., 1919, 173.
acrionalis Walker. Cat. Brit. Mus., xix, 925.
æglealis Walker. *Ibid.*, xviii, 565.
chalybealis Fernald. (MS. name.) (C.R.E.)
fissalis Grote. Bull. Geol. Geog. Surv. Terr., vi, 273. (C.R.E.)
fumalis Guenée. Spec. Gén., viii, 358: Moth Book, 397.
funebris Ström. *octomaculata.* Moth Book, 398. (F.W.H.)
futilalis Lederer. *erectalis.* Can. Ent., viii, 99.
illibalis Hübner. Zutr. Exot. Schmett., i, 19.
insequalis Guenée. Spec. Gén., viii, 447: Moth Book, 398.
niveicilialis Grote. Bull. Buff. Soc., Nat. Sci., ii, 232: Moth Book, 398 (F.W.H.)
orphisalis Walker. *adipaloides.* Trans. Am. Ent. Soc., i, 26. (C.R.E.)
oxydalis Guenée. Spec. Gén., viii, 328.
penitalis Grote. Can. Ent., viii, 98. (C.R.E.)
pertextalis Lederer. Wien. Ent. Mon., vii, 466: Moth Book, 397.
phœnicealis Hübner. Zutr. Exot. Schmett., i, 22.
rubricalis Hübner. *similalis.* Schmett. Eur., 22, pl. 16, f. 106. (F.W.H.)
signatalis Walker. *vinulenta* Grote and Robinson. Trans. Am. Ent. Soc., i, 16.
theseusalis Walker. Cat. Brit. Mus., xviii, 562.
thestealis Walker. *Ibid.*, xviii, 733.
sp. (Undescribed.)

Eustixia Hübner.

pupula Hübner. Moth Book, 398.

Nymphula Schrank.

allionealis Walker. Cat. Brit. Mus., xvii, 453.
badiusalis Walker. *Ibid.*, xix, 955.
icciusalis Walker. *Ibid.*, xix, 971.
maculalis Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 218.
obscuralis Grote. Papilio, i, 18: Moth Book, 399.

Geshna Dyar.

primordialis Dyar. Jour. N. Y. Ent. Soc., xiv, 97.

Elophila Hübner.

fulicalis Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 217.

Diathrausta Lederer.

reconditalis Walker. Cat. Brit. Mus., xix, 943.

Scoparia Haworth.

basalis Walker. Cat. Brit. Mus., xxxiv, 1497.
centuriella Denis and Schiffermüller. *ninguidalis.* Trans. Am. Ent. Soc., xiii, 147. (C.H.Y.)
rectilinea Zeller. Verh. Zool-Bot. Ges. Wien., xxiv, 5.

Aglossa Latreille.

cuprealis Hübner. Verz. bek. Schmett., 1826, 348.

Hypsopygia Hübner.

costalis Fabricius. Clover hay worm. Rept. Conn. Agr. Expt. Sta., 1900, 315: Moth Book, 399.

Pyralis Linnæus.

cuprina Zeller. Verh. Zool-Bot. Ges. Wien., xxii, 497. (C.R.E.)
farinalis Linnæus. Meal snout moth. Bur. Ent., Bull. 4, new ser., 119: Moth Book, 400.

Herculia Walker.

cohortalis Grote. Can. Ent., x, 233.
intermedialis Walker. Trans. Ent. Soc. Lond., i, 118.
olinalis Guenée. Spec. Gén., viii, 118: Moth Book, 401.

Omphalocera Lederer.

dentosa Grote. Bull. Geol. Geog. Surv. Terr., vi, 272.

Tosale Walker.

oviplagis Walker. *anthæcioides.* Trans. Am. Ent. Soc., i, 15. (C.R.E.)

Arta Grote.

statalis Grote. Bull. Buff. Soc., Nat. Sci., ii, 230.

Condylolomia Grote.

participialis Grote. Bull. Buff. Soc., Nat. Sci., i, 177. (C.R.E.)

Galasa Walker.

rubidana Walker. Cat. Brit. Mus., xxxv, 1802.

Schœnobius Duponchel.

clemensellus Robinson. Ent. Am., iv, 138. (C.H.Y.)
forficellus Thunberg. *longirostrellus.* *Ibid.,* iv, 139.
tripunctellus Robinson. *Ibid.,* iv, 136.
unipunctellus Robinson. *Ibid.,* iv, 136.

Crambus Fabricius.

agitatellus Clemens. N. A. Cramb., 37.
albellus Clemens. *Ibid.,* 38.
alboclavellus Zeller. *Ibid.,* 36: Moth Book, 402.
bidens Zeller. N. A. Cramb., 32. (C.R.E.)
caliginosellus Clemens. *Ibid.,* 61.
decorellus Zincken. *Ibid.,* 52.
elegans Clemens. *Ibid.,* 45.
girardellus Clemens. *Ibid.,* 28.
hortuellus Hübner. *Ibid.,* 40.
laqueatellus Clemens. *Ibid.,* 35: Moth Book, 402.
leachellus Zincken. N. A. Cramb., 29.
luteolellus Clemens. *Ibid.,* 64. (C.R.E.)
mutabilis Clemens. *Ibid.,* 57.
præfectellus Zincken. *Ibid.,* 31.
ruricolellus Zeller. *Ibid.,* 49.
teterrellus Zincken. *Ibid.,* 51. (C.R.E.)
trisectus Walker. *Ibid.,* 59: Moth Book, 403.
turbatellus Walker. N. A. Cramb., 44: Moth Book, 402.
vulgivagellus Clemens. N. A. Cramb., 47.
zeellus Fernald. *Ibid.,* 62. (C.R.E.)

Haimbachia Dyar.

placidellus Haimbach. Ent. News, xviii, 44.

Argyria Hübner.

auratella Clemens. N. A. Cramb., 72.
multilineatella Hulst. Ent. Am., iii, 134. (C.R.E.)
nivalis Drury. *Ibid.,* iii, 71.

Platytes Guenée.

vobisne Dyar. Insec. Insc. Menst., viii, 162.

Diatræa Guilding.

alleni Fernald. Ent. Am., iv, 120. (C.R.E.)
differentialis Fernald. *Ibid.*, iv, 120. (C.R.E.)

Chilo Zincken.

densellus Zeller. N. A. Cramb., 79.
plejadellus Zincken. *Ibid.*, 78. (C.H.Y.)

Dicymolomia Zeller.

julianalis Walker. Cat. Brit. Mus., xvii, 438. (C.R.E.)

Galleria Fabricius.

mellonella Linnæus. Wax moth. Bee moth. Bur. Ent., Bull. 75, 19: Moth Book, 406.

Paralipsa Butler.

fulminalis Zeller. Verh. Zool-Bot. Ges. Wien., xxii, 560. (C.R.E.)
furellus Zeller. *Ibid.*, xxxiii, 212. (C.R.E.)

Achroia Haworth.

grisella Fabricius. Cat. Lep. Eur., ii, No. 3.

Epipaschia Clemens.

superatalis Clemens. Ent. Am., v, 51.

Oneida Hulst.

lunulalis Hulst. Ent. Am., iii, 130. (C.R.E.)

Benta Walker.

asperatella Clemens. Proc. Acad. Nat. Sci., Phila., 1860, 207. (C.R.E.)

Lanthape Clemens.

platanella Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 207. (C.R.E.)

Wanda Hulst.

baptisiella Fernald. Ent. Am., iii, 128.

Tetralopha Zeller.

asperatella Clemens, form **nephelotella** Hulst. *clemensalis* Dyar. Ent. Am., v, 70.
militella Zeller. *Ibid.*, v, 71.
robustella Zeller. *diluculella*. *Ibid.*, v, 71.

Myelois Hübner.

obnupsella Hulst. Trans. Am. Ent. Soc., xvii, 118.

Acrobasis Zeller.*

angusella Grote. *eliello* Dyar. Proc. Wash. Ent. Soc., x, 43. (C.R.E.)
aurorella Ely. *Ibid.,* xii, 67.
betulella Hulst. Trans. Am. Ent. Soc., xvii, 125. (C.R.E.)
caryalbella Ely. Insec. Insc. Menst., i, 52. (C.R.E.)
caryæ Grote. Walnut bud moth. Rept. Conn. Agr. Expt. Sta., 1912, 253.
caryivorella Ragonot. Proc. Wash. Ent. Soc., x, 42.
comptoniella Hulst. *Ibid.,* x, 42.
coryliella Dyar. *Ibid.,* x, 47.
dyarella Ely. *Ibid.,* xii, 67. (C.R.E.)
feltella Dyar. *Ibid.,* xi, 214. (C.R.E.)
hebescella Hulst. *Ibid.,* x, 44. (C.R.E.)
irrubriella Ely. *Ibid.,* x, 161. (C.R.E.)
latifasciella Dyar. *Ibid.,* x, 45.
malipennella Dyar. *Ibid.,* x, 47. (C.R.E.)
nebulella Riley. *Mineola.* Rept. Ins. Mo., iv, 41. (C.R.E.)
normella Dyar. Proc. Wash. Ent. Soc., x, 46. (C.R.E.)
ostryella Ely. Insec. Insc. Menst., i, 54. (C.R.E.)
palliolella Ragonot. Trans. Am. Ent. Soc., xvii, 121. (C.R.E.)
rubrifasciella Packard. Ann. Lyc. Nat. Hist., N. Y., x, 267.
secundella Ely. Insec. Insc. Menst., i, 55. (C.R.E.)
stigmella Dyar. Proc. Wash. Ent. Soc., x, 43. (C.R.E.)
sylviella Ely. *Ibid.,* x, 48. (C.R.E.)
sp.?

Mineola Hulst.

indigenella Zeller. Apple leaf crumpler. Isis, 651: Moth Book, 409.
juglandis LeBaron. Ins. Ill., ii, 123. (C.R.E.)
vaccinii Riley. Cranberry fruit worm. Can. Ent., xvi, 237. (C.R.E.)

Dioryctria Zeller.

abietella Denis and Schiffermüller. Syst. Verz. Wien., x, 138.
reniculella Grote. N. A. Ent., i, 67. (C.R.E.)

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* See also appendix.

Pinipestis Grote.

zimmermani Grote. Pine tip moth. Rept. Conn. Agr. Expt. sta., 1916, 122.

Tacoma Hulst.

nyssæcolella Dyar. Proc. Wash. Ent. Soc., vi, 112. (C.R.E.)

Glyptocera Ragonot.

consobrinella Zeller. Verh. Zool-Bot. Ges. Wien., 528. (C.R.E.)

Ortholepis Ragonot.

jugosella Ragonot. Diag. N. A. Phyc., 6. (C.R.E.)

Ambesa Grote.

busckella Dyar. Proc. Wash. Ent. Soc., vi, 108. (C.R.E.)

Nephopteryx Hübner.

fasciolalis Hulst. Trans. Am. Ent. Soc., xiii, 162. (C.R.E.)
gilvibasella Hulst. *Ibid.*, xvii, 145. (C.R.E.)
ovalis Packard. *latifasciella*. N. A. Ent., i, 11. (C.R.E.)
scobiella Grote. *Ibid.*, i, 51.

Meroptera Grote.

unicolorella Hulst. Ent. Am., iii, 136.

Salebria Zeller.

contatella Grote. N. A. Ent., i, 50.

Elasmopalpus Blanchard

lignosellus Zeller. Isis, 1848, 883.

Zophodia Hübner.

grossulariæ Riley. Gooseberry fruit worm. Trans. Am. Ent. Soc., xvii, 173.

Immyrla Dyar.

nigrovittella Dyar. Jour. N. Y. Ent. Soc., xiv, 108.

Euzophera Zeller.

ochrifrontella Zeller. Trans. Am. Ent. Soc., xvii, 177.
semifuneralis Walker. *Ibid.*, xvii, 175.

Vitula Ragonot.

edmandsii Packard. Trans. Am. Ent. Soc., xvii, 178. (C.R.E.)

Canarsia Hulst.

ulmiarrosorella Clemens. Trans. Am. Ent. Soc., xvii, 180.

Hulstea Ragonot.

undulatella Clemens. Trans. Am. Ent. Soc., xvii, 187.

Homœosoma Curtis.

mucidellum Ragonot. Trans. Am. Ent. Soc., xvii, 193. (C.R.E.)
reliquella Dyar. Proc. Wash. Ent. Soc., vi, 112.
uncanale Hulst. *Ibid.*, xvii, 192. (C.R.E.)

Ephestia Guenée.

kuehniella Zeller. Mediterranean flour moth. Special Rept. Minn. State Ent., 1904: Moth Book, 412.

Ephestiodes Ragonot.

infimella Ragonot. Trans. Am. Ent. Soc., xvii, 194. (C.R.E.)

Varneria Dyar.

postremella Dyar. Proc. Wash. Ent. Soc., vi, 115. (C.R.E.)

Eurythmia Ragonot.

angulella Ely. Proc. Wash. Ent. Soc., xii, 202. (C.R.E.)
diffusella Ely. *Ibid.*, xii, 202. (C.R.E.)
furnella Ely. *Ibid.*, xii, 202. (C.R.E.)
parvulella Ely. *Ibid.*, xii, 202. (C.R.E.)

Moodna Hulst.

ostrinella Clemens. Proc. Acad. Nat. Sci. Phila., 1860, 206.

Plodia Guenée.

interpunctella Hübner. Indian meal moth. Rept. Conn. Agr. Expt. Sta., 1905, 252: Moth Book, 415.

Atacosa Hulst.

glareosella Zeller. Trans. Am. Ent. Soc., xvii, 211.

Cayuga Hulst.

gemmatella Hulst. Ent. Am., iii, 134. (C.R.E.)

Peoria Ragonot.

approximella Walker. Cat. Brit. Mus., xxxv, 1722.

Bandera Ragonot.

binotella Zeller. Trans. Am. Ent. Soc., xvii, 202.

Family SESIIDÆ.

Sesia Fabricius.

bolteri Hy. Edwards. *Synanthedon.* Papilio, iii, 155.
scitula Harris. *Synanthedon.* Mon. N. A. Ses., 298: Moth Book, 387.
tipuliformis Clerck. *Synanthedon.* Mon. N. A. Ses., 285: Moth Book, 385.

Bembecia Hübner.

marginata Harris. Mon. N. A. Ses. 260: Moth Book, 383.
marginata var. **albicoma** Hulst. Mon. N. A. Ses., 262.

Synanthedon Hübner.

exitiosa Say. *Sanninoidea.* Peach borer. Rept. Conn. Agr. Expt. Sta., 1909-10, 359: Moth Book, 384.
pictipes Grote and Robinson. *Ægeria. Sesia.* Mon. N. A. Ses., 291.

Memythrus Newman.

asilipennis Boisduval. Mon. N. A. Ses., 252.
tricinctus Harris. *Ibid.*, 247.

Podosesia Mœschler.

syringæ Harris. Lilac borer. Mon. N. A. Ses., 244: Moth Book, 382.

Alcothoë Hy.-Edwards.

caudata Harris. Mon. N. A. Ses., 240: Moth Book, 382. (F.W.H.)

Melittia Hübner.

satyriniformis Hübner. Squash borer. Rept. Conn. Agr. Expt. Sta., 1907-08, 806: Moth Book, 380.

Family COSSIDÆ.

Prionoxystus Grote.

macmurtrei Guérin-Méneville. *Cossus. querciperda.* Ins. N. Y., Fourth Rept., Rept. N. Y. State Agr. Soc., 1857, 790.
robiniæ Peck. Carpenter worm. Ins. Aff. Park and Woodland Trees, 79: Moth Book, 378.

Zeuzera Latreille.

pyrina Linnæus. Leopard moth. Rept. Conn. Agr. Expt. Sta., 1911, 317: Moth Book, 376.

Family THYRIDÆ.

Thyris Laspeyres.

lugubris Boisduval. Spec. Gén. Pl. 14, f. 11, 1852: i, 490, 1874.
maculata Harris. Am. Jour. Sci., xxxvi, 313: Moth Book, 374.

Family PYROMORPHIDÆ.

Harrisina Packard.

americana Guérin-Méneville. Icon. Reg. An. Ins., 500: Moth Book, 372.

Pyromorpha Herrich-Schæffer.

dimidiata Herrich-Schæffer. Moth Book, 371.

Family MEGALOPYGIDÆ.

Lagoa Harris.

crispata Packard. Crinkled flannel moth. Proc. Phila. Ent. Soc., iii, 335: Moth Book, 369.

Family COCHLIDIIDÆ.

Tortricidia Packard.

flexuosa Grote. Jour. N. Y. Ent. Soc., vi, 94: Moth Book, 368.

Packardia Grote and Robinson.

elegans Packard. *nigripunctata*. Proc. Phila. Ent. Soc., iii, 342: Moth Book, 367. (C.R.E.)
elegans var. **fusca** Packard. Proc. Phila. Ent. Soc., iii, 343. (C.R.E.)
testacea Packard. *Ibid.*, iii, 348: Moth Book, 368. (C.R.E.)

Lithacodes Packard.

fasciola Herrich-Schæffer. Jour. N. Y. Ent. Soc., v, 1: Moth Book, 367.
fiskiana Dyar. Ent. News, xi, 333.

Cochlidion Hübner.

biguttata Packard. Jour. N. Y. Ent. Soc., v, 167: Moth Book, 367.
rectilinea Grote and Robinson var. **latomia** Harvey. Can. Ent. ix, 75: Moth Book, 367. (C.H.Y.)

Prolimacodes Schaus.

scapha Harris. Jour. N. Y. Ent. Soc., iv, 172: Moth Book, 367.

Phobetron Hübner.

pithecium Smith and Abbot. Hag-moth. Jour. N. Y. Ent. Soc., iv, 178: Moth Book, 366.

Sisyrosea Grote.

textula Herrich-Schæffer. *inornata.* Jour. N. Y. Ent. Soc., iv, 185: Moth Book, 366. (C.R.E.)

Adoneta Clemens.

spinuloides Herrich-Schæffer. Jour. N. Y. Ent. Soc., v, 5: Moth Book, 365.

Euclea Hübner.

chloris Herrich-Schæffer. *viridis.* Jour. N. Y. Ent. Soc., v, 61: Moth Book, 365.

delphinii Boisduval var. **interjecta** Dyar. Ent. News, ii, 61.

delphinii var. **querceti** Herrich-Schæffer. Samml. Ausser. Schmett., f. 174.

delphinii var. **viridiclava** Walker. Cat. Brit. Mus., v, 1154: Moth Book, 365. (C.H.Y.)

indeterminata Boisduval. *vernata.* Jour. N. Y. Ent. Soc., v, 10: Moth Book, 365. (C.H.Y.)

Sibine Herrich-Schæffer.

stimulea Clemens. *Empretia.* Saddle-back caterpillar. Jour. N. Y. Ent. Soc., iv, 1: Moth Book, 364.

Family PSYCHIDÆ.

Solenobia Zeller.

walshella Clemens. Proc. Phila. Ent. Soc., i, 132.

Eurycyttarus Hampson.

confederata Grote and Robinson. Trans. Am. Ent. Soc., ii, 191: Moth Book, 363.

Thyridopteryx Stephens.

ephemeræformis Haworth. Bag-worm. Bur. Ent., Circ. 97: Moth Book, 361.

Family LACOSOMIDÆ.

Lacosoma Grote.

chiridota Grote. Proc. Phila. Ent. Soc., iii, 78: Moth Book, 359.

Cicinnus Blanchard.

melsheimeri Harris. Ins. Inj. Veg., Flint Ed., 415: Moth Book, 359. (C.H.Y.)

Family EPIPLEMIDÆ.

Calledapteryx Grote.

dryopterata Grote. Trans. Am. Ent. Soc., ii, 120: Moth Book, 356. (C.R.E.)

Family GEOMETRIDÆ.

Brephos Ochsenheimer.

infans Mœschler. U. S. Nat. Mus., Bull., No. 44, 396: Moth Book, 355.

Abbotana Hulst.

clemataria Smith and Abbot. Mon. Geom., 561: Moth Book, 353. (F.W.H.)

Sabulodes Guenée.

arcasaria Walker. *depontanata.* Mon. Geom., 483: Moth Book, 353.

lorata Grote. Mon. Geom., 547: Moth Book, 353.

sulphurata Packard. Mon. Geom., 484: Moth Book, 353.

transversata Drury. Mon. Geom., 559: Moth Book, 353.

Tetracis Guenée.

crocallata Guenée. Mon. Geom., 548: Moth Book, 353.

Caberodes Guenée.

confusaria Hübner. Mon. Geom., 534: Moth Book, 352.

confusaria var. **metrocamparia** Guenée. Spec. Gén., ix, 137. (F.W.H.)

majoraria Guenée. Mon. Geom., 536: Moth Book, 352.

Syssaura Hübner.

infensata Guenée. Spec. Gén., ix, 67.
infensata var. **biclaria** Walker. *varus.* Mon. Geom., 538: Moth Book, 352.

Azelina Guenée.

ancetaria Hübner. *hubnerata.* Mon. Geom., 520: Moth Book, 352.

Priocycla Guenée.

armataria Herrich-Schæffer. Mon. Geom., 510: Moth Book, 351.

Metanema Guenée.

determinata Walker. Cat. Brit. Mus., xxxv, 1551: Moth Book, 351.
inatomaria Guenée. Mon. Geom., 543.

Eutrapela Hübner.

alciphearia Walker. Cat. Brit. Mus., xx, 184. (H.W.F.)
kentaria Grote. Trans. Am. Ent. Soc., i, 359. (C.R.E.)

Euchlæna Hübner.

effectaria Walker. Mon. Geom., 514.
johnsonaria Fitch. *bilinearia. Ibid.,* 511.
marginata Minot. *Ibid.,* 505: Proc. Bost. Soc. Nat. Hist., xi, 169.
obtusaria Hübner. Mon. Geom., 516: Moth Book, 350.
serrata Drury. *serratatia.* Mon. Geom., 517: Moth Book, 350.
vinulentaria Grote and Robinson. Mon. Geom., 506. (C.R.E.)

Gonodontis Hübner.

duaria Guenée. Mon. Geom., 502: Moth Book, 350.
hypochraria Herrich-Schæffer. Mon. Geom., 504: Moth Book, 350.
obfirmaria Hübner. Mon. Geom., 499: Moth Book, 350. (F.W.H.)
warneri Harvey. *apiciaria.* Mon. Geom., 502.

Ania Stephens.

limbata Haworth. *filamentaria.* Mon. Geom., 471: Moth Book, 349.

Hyperitis Guenée.

amicaria Herrich-Schæffer. *nyssaria.* Mon. Geom., 461: Moth Book, 349.

Plagodis Hübner.

keutzingaria Packard. Mon. Geom., 468: Moth Book, 349.
serinaria Herrich-Schæffer. Mon. Geom., 469: Moth Book, 349.

Xanthotype Warren.

crocataria Fabricius. Mon. Geom., 474: Moth Book, 349.

Ennomos Treitschke.

magnarius Guenée. *alniaria*. Mon. Geom., 529: Moth Book, 348.
subsignarius Hübner. *Eugonia*. Snow-white linden moth. Elm span-worm. Mon. Geom., 528: Moth Book, 348.

Eugonobapta Warren.

nivosaria Guenée. *nivosata*. Mon. Geom., 338: Moth Book, 348.

Metrocampa Latreille.

prægrandaria Guenée. *perlaria*. Mon. Geom., 491: Moth Book, 348.

Therina Hübner.

athasiaria Walker. *seminudaria*. Mon. Geom., 495: Moth Book, 348. (F.W.H.)
fervidaria Hübner. Mon. Geom., 493: Moth Book, 348.

Anagoga Hübner.

pulveraria Linnæus. Syst. Nat., 521.

Cingilia Walker.

catenaria Drury. Chain-dotted Geometer. Mon. Geom., 217: Moth Book, 347.

Erranis Hübner.

tiliaria Harris. *Hybernia*. Lime tree moth. Mon. Geom. 409: Moth Book, 347.

Phigalia Duponchel.

titea Cramer. Mon. Geom., 442: Moth Book, 347.

Nacophora Hulst.

quernaria Smith and Abbot. Mon. Geom., 411. (H.W.F.)

Lycia Hübner.

cognataria Guenée. Mon. Geom., 413: Moth Book, 345.
ursaria Walker. Mon. Geom., 414.

Epimecis Hübner.

virginaria Cramer. *hortaria.* Mon. Geom., 443: Moth Book, 344. (F.W.H.)

Ectropis Hübner.

crepuscularia Denis and Schiffermüller. Mon. Geom., 428: Moth Book, 344.

Æthaloptera Hulst.

intextata Walker. *anticaria.* Mon. Geom., 423. (C.R.E.)

Melanophia Hulst.

canadaria Guenée. *Tephrosia.* Mon. Geom., 425: Moth Book, 344.

Cleora Curtis.

larvaria Guenée. Mon. Geom., 437.
pampinaria Guenée. *Ibid.*, 432: Moth Book, 344.
takenaria Pearsall. Can. Ent., xli, 119.

Selidosema Hübner.

humarium Guenée. Mon. Geom., 435.
umbrosarium Hübner. *Ibid.*, 439. (H.W.F.)

Tornos Morrison.

scolopacinarius Guenée. Mon. Geom., 565. (C.R.E.)

Alcis Curtis.

multilineata Packard. Mon. Geom., 287.

Paraphia Guenée.

subatomaria Wood. Mon. Geom., 417.

Nepytia Hulst.

semiclusaria Walker. Cat. Brit. Mus., xxiv, 1506.

Catopyrrha Hübner.

coloraria Fabricius. Mon. Geom., 206: Moth Book, 342.
coloraria var. **dissimilaria** Hübner. Mon. Geom., 208: Moth Book, 342.

Apæcasia Hulst.

defluata Walker. Mon. Geom., 245: Moth Book, 342.
detersata Guenée. Mon. Geom., 243.

Homoclodes Hulst.

fritillaria Guenée. Mon. Geom., 489.

Cymatophora Hübner.

ribearia Fitch. Mon. Geom., 248: Moth Book, 340.

Macaria Curtis.

æquiferaria Walker. Mon. Geom., 295.
bisignata Walker. *Ibid.*, 290.
minorata Packard. *Ibid.*, 291. (C.R.E.)

Philobia Duponchel.

enotata Guenée. Mon. Geom., 288: Moth Book, 339. (F.W.H.)

Sciagraphia Hulst.

continuata Walker. *orillata*. Mon. Geom., 265. (C.R.E.)
granitata Guenée. *Ibid.*, 285.
heliothidata Guenée. *ocellinata*. *Ibid.*, 283: Moth Book, 339.

Deilinea Hübner.

erythremaria Guenée. Mon. Geom., 306.
liberaria Walker. *integraria*. *lintneraria*. *Ibid.*, 209. (C.R.E.)
variolaria Guenée. *intentata*. *Ibid.*, 306: Moth Book, 338.

Gueneria Packard.

basiaria Walker. *basiata*. Mon. Geom., 308.

Psysostegania Warren.

pustularia Guenée. Mon. Geom., 310: Moth Book, 338.

Heliomata Grote.

cycladata Grote. Proc. Phila. Ent. Soc., vi, 30: Moth Book, 338. (F.W.H.)

Anaplodes Packard.

iridaria Guenée. Mon. Geom., 394. (H.W.F.)
remotaria Walker. Cat. Brit. Mus., xxii, 530.

Aplodes Guenée.

mimosaria Guenée. Mon. Geom., 386, 388.
rubrifrontaria Packard. *Ibid.*, 386.

Synchlora Guenée.

ærata Fabricius. *glaucaria*. Mon. Geom., 392.
denticulata Walker. *excurvaria*. *Ibid.*, 381.

Eucrostis Hübner.

incertata Walker. *Nemoria gratata*. Mon. Geom., 372. (G.D.)

Nemoria Hübner.

subcroceata Walker. Mon. Geom., 372. (F.W.H.)

Chlorochlamys Hulst.

chloroleucaria Guenée. Mon. Geom., 370: Moth Book, 336.

Eois Hübner.

demissaria Hübner var. **russata** Hulst. Ent. Am., ii, 187.
inductata Guenée. Mon. Geom., 340: Moth Book, 335.
ossularia Hübner. *ossulata.* Mon. Geom. 329: Moth Book, 335.

Leptomeris Hübner.

quinquelinearia Packard. Mon. Geom., 348: Moth Book, 333. (C.H.Y.)

Cinglis Guenée.

purata Guenée. Mon. Geom., 353.
similaria Walker. *quadrilineata. Ibid.,* 345.

Synelis Hulst.

ennucleata Guenée. *alabastaria.* Mon. Geom., 347: Moth Book, 333.
ennucleata var. **adornata** Prout. Can. Ent., xxxix, 412.
ennucleata var. **relevata** Swett. *Ibid.,* xxxix, 141.

Cosymbia Hübner.

lumenaria Hübner. Mon. Geom., 365: Moth Book, 333.

Pleuroprucha Mœschler.

insulsaria Guenée. *Deptalia.* Mon. Geom., 335.

Erastria Hübner.

amaturaria Walker. Mon. Geom., 317: Moth Book, 333.

Hæmatopsis Hübner.

grataria Fabricius. Mon. Geom., 219: Moth Book, 332.

Petrophora Hübner.

ferrugata Clerck. *Xanthorhoë ferrugaria.* Mon. Geom., 146. (C.R.E.)

Gypsochroa Hübner.

designata Hufnagel. Mon. Geom., 144: Moth Book, 332.

Hydriomena Hübner.

latirupta Walker. Mon. Geom., 169: Moth Book, 331.
multiferata Walker. Mon. Geom., 81.

Mesoleuca Hübner.

implicata Guenée. *multilineata.* Mon. Geom., 71. (F.W.H.)
intermediata Guenée. Mon. Geom., 157: Moth Book, 330.
lacustrata Guenée. Mon. Geom., 158: Moth Book, 330.
ruficilliata Guenée. Mon. Geom., 153: Moth Book, 330.

Orthonama Hübner.

Percnoptilota Hulst.

obstipata Fabricius. *fluviata* Hübner. Mon. Geom., 78: Moth Book, 330.

Rheumaptera Hübner.

hastata Linnæus. Mon. Geom., 164: Moth Book, 329.

Eustroma Hübner.

diversilineata Hübner. Mon. Geom., 126: Moth Book, 329.
diversilineata var. **gracilineata** Guenée. Spec. Gén., x, 476.

Hydria Hübner.

undulata Linnæus. *Calocalpe.* Mon. Geom., 172: Moth Book, 329.

Euchœca Hübner.

albovittata Guenée. Mon. Geom., 189: Moth Book, 328.

Venusia Curtis.

comptaria Walker. Cat. Brit. Mus., xxi, 406; Moth Book, 328.

Eucymatoge Hübner.

intestinata Guenée. Mon. Geom., 170: Moth Book, 328.

Eupithecia Curtis.

conformata Pearsall. *Tephroclystis.* Ent. News. xix, 128.
interruptofasciata Packard. Rept. Peab. Acad. Sci., v, 59.
miserulata Grote. Proc. Phila. Ent. Soc., ii, 32.
nebulosa Hulst. Trans. Am. Ent. Soc., xxiii, 266.
packardata Taylor. *absinthiata.* Mon. Geom., 49. (L.W.S.)

Heterophleps Herrich-Schæffer.

triguttaria Herrich-Schæffer. Mon. Geom., 193: Moth Book, 327.

Eudule Hübner.

mendica Walker. Beggar. Cat. Brit. Mus., ii, 576: Moth Book, 327.

Alsophila Hübner.

pometaria Harris. Fall canker worm. Rept. Conn. Agr. Expt. Sta., 1908, 783: Moth Book, 326.

Paleacrita Riley.

vernata Peck. Spring canker worm. Rept. Conn. Agr. Expt. Sta., 1908, 782: Moth Book, 324.

Nyctobia Hulst.

limitata Walker. Mon. Geom., 457: Moth Book, 324.

Dyspteris Hübner.

abortivaria Herrich-Schæffer. Mon. Geom., 368: Moth Book, 323.

Family PLATYPTERYGIDÆ.

Falcaria Haworth.

bilineata Packard. Proc. Phila. Ent. Soc., iii, 376: Moth Book, 321.

Drepana Schrank.

arcuata Walker. Cat. Brit. Mus., v, 1164: Moth Book, 321.

Oreta Walker.

irrorata Packard. Moth Book, 321.
rosea Walker. *Ibid.*, 321.

Eudeilinea Packard.

herminiata Guenée. Spec. Gén., x, 58.

Family LASIOCAMPIDÆ.

Epicnaptera Rambur.

americana Harris. *Gastropacha.* Moth Book, 314.

Malacosoma Hübner.

americana Fabricius. *Clisiocampa.* Tent-caterpillar. Conn. Agr. Expt. Sta., Rept. 1902, 142; 1913, 226; Bull. 177: Moth Book, 312.
disstria Hübner. *Clisiocampa sylvatica.* Forest tent-caterpillar. N. Y. Agr. Expt. Sta., Bull. 159: Moth Book, 313.

Tolype Hübner.

velleda Stoll. Moth Book, 312.

Family LIPARIDÆ.

Euproctis Hübner.

chrysorrhœa Linnæus. Brown-tail moth. Conn. Agr. Expt. Sta., Rept., 1907, 313; Bull. 182; Moth Book, 309.

Porthetria Hübner.

dispar Linnæus. *Ocneria.* Gipsy moth. Conn. Agr. Expt. Sta., Rept., 1905, 246; Bull. 186: Moth Book, 308.

Olene Hübner.

achatina Smith and Abbot. Lep. Ins. Ga., ii, 77: Moth Book, 308.

cinnamonea Grote. Proc. Phila. Ent. Soc., vi, 6.

atomaria Walker. *obliquata.* Contr. Nat. Hist. Lepidop., ii, 67; Proc. Phila. Ent. Soc., vi, 4.

atomaria var. **parallela** Grote and Robinson. Contr. Nat. Hist. Lepidop, ii, 69.

leucophæa Smith and Abbot. Lep. Ins. Ga., ii, 78: Moth Book, 308.

plagiata Walker. *pinicola* Dyar. Cat. Brit. Mus., iv, 109.

Hemerocampa Dyar.

definita Packard. *Orgyia.* Proc. Phila. Ent. Soc., iii, 332: Moth Book, 308. (C.R.E.)

leucostigma Smith and Abbot. *Orgyia.* White-marked tussock moth. Rept. Conn. Agr. Expt. Sta., 1905, 230: Moth Book, 306.

Notolophus Germar.

antiqua Linnæus. Rusty tussock moth. Moth Book, 306.

Family THYATIRIDÆ.

Pseudothyatira Grote.

cymatophoroides Guenée. Spec. Gén., v, 13: Moth Book, 304.

expultrix Grote. Proc. Phila. Ent. Soc., ii, 58: Moth Book, 304.

Habrosyne Hübner.

scripta Gosse. *Thyatira.* Cat. Noc., 27: Moth Book, 303.

Family NOTODONTIDÆ.

Ellida Grote.

caniplaga Walker. Bomb. Moths, 169: Moth Book, 300.

Gluphisia Boisduval.

septentrionalis Walker. Bomb. Moths, 90: Moth Book, 300.

Fentonia Butler.

marthesia Cramer. Bomb. Moths, 257: Moth Book, 300.

Harpyia Ochsenheimer.

borealis Boisduval. Bomb. Moths, 264: Moth Book, 299.
cinerea Walker. Bomb. Moths, 273: Moth Book, 299.

Cerura Schrank.

scitiscripta Walker var. **multiscripta** Riley. Bomb. Moths, 276: Moth Book, 299.

Hyparpax Hübner.

aurora Smith and Abbot. Bomb. Moths, 284: Moth Book, 299.

Schizura Doubleday.

badia Packard. Bomb. Moths, 208: Moth Book, 299.
concinna Smith and Abbot. Red-humped caterpillar. Bomb. Moths, 212: Moth Book, 298.
ipomϾ Doubleday. Bomb. Moths, 194: Moth Book, 298.
ipomϾ var. **cinereofrons** Packard. Proc. Phila. Ent. Soc., iii, 366.
leptinoides Grote. Bomb. Moths, 199: Moth Book, 299.
semirufescens Walker. *eximia*. Bomb. Moths, 210: Cat. Brit. Mus., xxxii, 450.
unicornis Smith and Abbot. Bomb. Moths, 203; Moth Book, 298.

Ianassa Walker.

lignicolor Walker. Bomb. Moths, 189: Moth Book, 298.

Misogada Walker.

unicolor Packard. *Heterocampa*. Bomb. Moths, 254: Moth Book, 297.

Heterocampa Doubleday.

bilineata Packard. Bomb. Moths, 218: Moth Book, 297.

biundata Walker. Bomb. Moths, 235: Moth Book, 297.

guttivitta Walker. Saddled prominent. Bomb. Moths, 230: Me. Agr. Expt. Sta., Bull. 161.

manteo Doubleday. Bomb. Moths, 224: Moth Book, 297. (C.R.E.)

obliqua Packard var. **trouvelottii** Packard. Proc. Phila. Ent. Soc., iii, 369.

umbrata Walker. Bomb. Moths, 249. (A.B.C.)

Symmerista Hübner.

albifrons Smith and Abbot. Bomb. Moths, 179: Moth Book, 296.

Nerice Walker.

bidentata Walker. Bomb. Moths, 171: Moth Book, 296.

Nadata Walker.

gibbosa Smith and Abbot. Bomb. Moths, 142: Moth Book, 296.

Lophodonta Packard.

angulosa Smith and Abbot. Bomb. Moths, 147: Moth Book, 295.

ferruginea Packard. Bomb. Moths, 150: Moth Book, 295. (F.W.H.)

Hyperæschra Butler.

georgica Herrich-Schæffer. *Drymonia.* Bomb. Moths, 153: Moth Book, pl. xl, 7.

stragula Grote. *Notodonta.* Bomb. Moths, 165: Moth Book, pl. xl, 1.

Pheosia Hübner.

rimosa Packard. *dimidiata.* Bomb. Moths, 158: Moth Book, 295.

Datana Walker.

angusii Grote and Robinson. Bomb. Moths, 110: Moth Book, 293.

contracta Walker. Bomb. Moths, 122.

integerrima Grote and Robinson. Bomb. Moths, 120: Moth Book, 294.

major Grote and Robinson. Bomb. Moths, 113.
ministra Drury. Yellow-necked caterpillar. Bomb. Moths, 106: Moth Book, 293.
perspicua Grote and Robinson. Bomb. Moths, 117: Moth Book, 294.

Melalopha Hübner.

albosigma Fitch. Bomb. Moths, 138: Moth Book, 293.
albosigma var. **specifica** Dyar. Can. Ent., xxiv, 180.
apicalis Walker. *vau.* Bomb. Moths, 125: Moth Book, 293.
inclusa Hübner. *Ichthyura americana.* Bomb. Moths, 131: Moth Book, 293.
inclusa var. **inversa** Packard. *palla.* Proc. Phila. Ent. Soc., iii, 352. (H.W.F.)
strigosa Grote. Bomb. Moths, 130. (H.W.F.)

Apatelodes Packard.

angelica Grote. Bomb. Moths, 103: Moth Book, 293.
torrefacta Smith and Abbot. Bomb. Moths, 100: Moth Book, 292.

Family NOCTUIDÆ.

Hypena Schrank.

humuli Harris. U. S. Nat. Mus. Bull. No. 48, 114: Moth Book, 287.

Plathypena Grote.

scabra Fabricius. Green clover worm. Rept. Conn. Agr. Expt. Sta., 1908-9, 828: 1919, 165: Moth Book, 287.

Bomolocha Hübner.

abalinealis Walker. U. S. Nat. Mus. Bull., No. 48, 100: Moth Book, 286.
atomaria Smith. Trans. Am. Ent. Soc., xxix, 216. (L.B.W.)
baltimoralis Guenée. U. S. Nat. Mus. Bull., No. 48, 96: Moth Book, 286.
bijugalis Walker. U. S. Nat. Mus. Bull., No. 48, 97: Moth Book, 286.
madefactalis Guenée. *profecta.* U. S. Nat Mus. Bull., No. 48: 102: Moth Book, 286.
manalis Walker. U. S. Nat. Mus. Bull., No. 48, 95: Moth Book, 286.

scutellaris Grote. U. S. Nat. Mus. Bull., No. 48, 98: Moth Book, 286.
toreuta Grote. U. S. Nat. Mus. Bull., No. 105; Moth Book, 286.

Lomanaltes Grote.

eductalis Walker. U. S. Nat. Mus. Bull., No. 48, 109: Moth Book, 285.

Salia Hübner.

interpuncta Grote. U. S. Nat. Mus. Bull., No. 48, 90: Trans. Am. Ent. Soc., iv, 93.

Capis Grote.

curvata Grote. Can. Ent., xiv, 20: Moth Book, 285.

Palthis Hübner.

angulalis Hübner. U. S. Nat. Mus. Bull., No. 48, 86: Moth Book, 285.
asopialis Guenée. U. S. Nat. Mus. Bull., No. 48, 87: Moth Book, 285.

Dircetis Grote.

vitrea Grote. Bull. Geol. Geog. Surv. Terr., iv, 186.

Gaberasa Walker.

ambigualis Walker. U. S. Nat. Mus., Bull. No. 48, 81: Moth Book, 284.

Heterogramma Guenée.

pyramusalis Walker. U. S. Nat. Mus. Bull., No. 48, 79: Moth Book, 284.

Menopsimus Dyar.

caducus Dyar. Jour. N. Y. Ent. Soc., xv, 110.

Tetanolita Grote.

floridana Smith. U. S. Nat. Mus. Bull., No. 48, 63.

Bleptina Guenée.

caradrinalis Guenée. U. S. Nat. Mus. Bull., No. 48, 58: Moth Book, 283.

Renia Guenée.

clitosalis Walker. U. S. Nat. Mus. Bull., No. 48, 72.
discoloralis Guenée. *Ibid.*, No. 48, 69: Moth Book, 283.
factiosalis Walker. U. S. Nat. Mus. Bull., No. 48, 73.
flavipunctalis Geyer. *Ibid.*, No. 48, 74.

Chytolita Grote.

morbidalis Guenée. U. S. Nat. Mus. Bull., No. 48, 56: Moth Book, 282.

Philometra Grote.

eumelusalis Walker. U. S. Nat. Mus. Bull., No. 48, 53.

hanhami Smith. Can. Ent., xxxi, 207. (C.R.E.)

Hormisa Walker.

absorptalis Walker. U. S. Nat. Mus. Bull., No. 48, 46: Moth Book, 282.

litophora Grote. U. S. Nat. Mus. Bull., No. 48, 48.

Zanclognatha Lederer.

cruralis Guenée. U. S. Nat. Mus. Bull., No. 48, 40.

lævigata Grote. *Ibid.*, No. 48, 36: Moth Book, 281.

lævigata var. **reversata** Dyar. U. S. Nat. Mus. Bull. No. 52, 241. (C.R.E.)

lituralis Hübner. U. S. Nat. Mus. Bull., No. 48, 32: Moth Book, 281.

marcidilinea Grote. U. S. Nat. Mus. Bull., No. 48, 43: Trans. Am. Ent. Soc., iv, 97.

ochreipennis Grote. U. S. Nat. Mus. Bull., No. 48, 44: Moth Book, 281.

pedipilalis Guenée. U. S. Nat. Mus. Bull., No. 48, 39.

Epizeuxis Hübner.

æmula Hübner. U. S. Nat. Mus. Bull., No. 48, 26: Moth Book, 281.

americalis Guenée. U. S. Nat. Mus. Bull., No. 48, 23: Moth Book, 281.

denticulalis Harvey. U. S. Nat. Mus. Bull., No. 48, 19: Moth Book, 281.

diminuendis Barnes and McDunnough. *Camptylochila*. Contr. Nat. Hist. Lepidop., iv, 126.

humerata Smith. Ann. N. Y. Acad. Sci., xviii, 123. (C.R.E.)

julia Barnes and McDunnough. *Camptylochila*. Contr. Nat. Hist. Lepidop., iv, 126.

lubricalis Geyer. U. S. Nat. Mus. Bull., No. 48, 17: Moth Book, 281.

majoralis Smith. U. S. Nat. Mus. Bull., No. 48, 25. (C.R.E.)

merricki Smith. Can. Ent., xxxvii, 260.

rotundalis Walker. U. S. Nat. Mus. Bull., No. 48, 20.

scobialis Grote. *Ibid.*, No. 48, 21: Moth Book, 281.

Erebus Latreille.

odora Linnæus. Moth Book, 279.

Phæocyma Hübner.

æruginosa Guenée. *Ypsia.* Proc. U. S. Nat. Mus., xxxv, 233.
cingulifera Walker *Homoptera. woodii. Ibid.*, xxxv, 261. (H.W.F.)
halata Smith. Proc. U. S. Nat. Mus., xxxv, 252. (A.B.C.)
horrida Hübner. *Zale. Ibid.*, xxxv, 270: Moth Book, 277.
lunata Drury. *Homoptera. Edusa*, Proc. U. S. Nat. Mus., xxxv, 225: Moth Book, 278.
minerea Guenée. *Homoptera.* Proc. U. S. Nat. Mus., xxxv, 238. (H.W.F.)
undularis Drury. *Ypsia. Ibid.*, xxxv, 231: Moth Book, 278.
unilineata Grote. *Homoptera.* Proc. U. S. Nat. Mus., xxxv, 245: Moth Book, 278.

Strenoloma Grote.

lunilinea Grote. Bull. Buff. Soc. Nat. Sci., i, 127: Moth Book, 276. (C.R.E.)

Celiptera Guenée.

frustulum Guenée. Moth Book, 275.

Remigia Guenée.

repanda Fabricius. Moth Book, 274. (C.H.Y.)

Agnomonia Hübner.

analis Drury. Moth Book, 275. (C.R.E.)

Parallelia Hübner.

bistriaris Hübner. Moth Book, 273.

Panapoda Guenée.

rufimargo Hübner. Moth Book, 273.
rufimargo var. **carneicosta** Guenée. Moth Book, 273.

Phoberia Hübner.

atomaris Hübner. Moth Book, 273.

Euparthenos Grote.

nubilis Hübner. Moth Book, 272.

Allotria Hübner.

elonympha Hübner. Moth Book, 272.

Catocala Schrank.

amatrix Hübner. Moth Book, 263.
amatrix var. **nurus** Walker. *Ibid.*, 263. (C.R.E.)
amica Hübner. *Ibid.*, 269.
amica var. **androphila** Guenée. Trans. Am. Ent. Soc., iv, 18. (C.R.E.)
amica var. **lineella** Grote. *Ibid.*, iv, 18: Moth Book, 269.
amica var. **nerissa** Hy. Edwards. Bull. Brook. Ent. Soc., iii, 61: Moth Book, 269. (C.H.Y.)
antinympha Hübner. Trans. Am. Ent. Soc., iv, 13: Moth Book, 267.
badia Grote and Robinson. Proc. Phila. Ent. Soc., vi, 22: Moth Book, 267.
blandula Hulst. *polygama*. Trans. Am. Ent. Soc., iv, 15.
briseis Edwards. Proc. Phila. Ent. Soc., ii, 508: Moth Book, 264.
cara Guenée. Trans. Am. Ent. Soc., iv, 7: Moth Book, 263.
cara var. **carissima** Hulst. Bull. Brook. Ent. Soc., ii, 97. (C.R.E.)
cerogama Guenée. Trans. Am. Ent. Soc., iv, 9: Moth Book, 266.
coccinata Grote. Trans. Am. Ent. Soc., iv, 6: Moth Book, 265.
concumbens Walker. Trans. Am. Ent. Soc., iv, 7: Moth Book, 263.
dejecta Strecker. Bull. Brook. Ent. Soc., ii, 97: Moth Book, 261.
epione Drury. Trans. Am. Ent. Soc., iv, 2: Moth Book, 260.
gracilis Edwards. Proc. Phila. Ent. Soc., ii, 511: Moth Book, 269.
grynea Cramer. Trans. Am. Ent. Soc., iv, 16: Moth Book, 269.
habilis Grote. Trans. Em. Ent. Soc., iv, 11: Moth Book, 268.
ilia Cramer. Trans. Am. Ent. Soc., iv, 8: Moth Book, 265.
ilia, var. **uxor** Guenée. Moth Book, 265.
innubens Guenée. Spec. Gén., vii, 98: Moth Book, 265. (F.W.H.)
innubens var. **flavidalis** Grote. Trans. Am. Ent. Soc., v, 95. (F.W.H.)
marmorata Edwards. Proc. Phila, Ent. Soc., ii, 508: Moth Book, 263. (C.R.E.)

micronympha Guenée var. **fratercula** Grote and Robinson. Proc. Phila. Ent. Soc., vi, 24: Moth Book, 269.

micronympha var. **gisela** Meyer. Bull. Brook. Ent. Soc., ii, 96: Moth Book, 269.

neogama Smith and Abbot. Trans. Am. Ent. Soc., iv, 9: Moth Book, 266.

paleogama Guenée. Trans. Am. Ent. Soc., iv, 10: Moth Book, 266.

paleogama var. **annida** Fager. Can. Ent., xiv, 120.

parta Guenée. Trans. Am. Ent. Soc., iv, 6: Moth Book, 264.

piatrix Grote. Trans. Am. Ent. Soc., iv, 10: Moth Book, 266.

præclara Grote and Robinson. Proc. Phila. Ent. Soc., vi, 25: Moth Book, 269.

relicta Walker. Trans. Am. Ent. Soc., iv, 4: Moth Book, 262. (C.R.E.)

relicta var. **bianca** Hy. Edwards. Bull. Brook. Ent. Soc., iii, 54: Moth Book, 262.

relicta var. **clara** Beutenmüller. Bull. Am. Mus. Nat. Hist., xix, 506.

relicta var. **phrynia** Hy. Edwards. Bull. Brook. Ent. Soc., iii, 54. (C.R.E.)

residua Grote. Proc. Bost. Soc. Nat. Hist., xvi, 242.

retecta Grote. Trans. Am. Ent. Soc., iv, 4: Moth Book, 262.

robinsonii Grote. Trans. Am. Ent. Soc., iv, 20: Moth Book, 262.

sancta Hulst. *connubialis. amasia.* Trans. Am. Ent. Soc., iv, 16: Moth Book, 268.

subnata Grote. Trans. Am. Ent. Soc., iv, 9: Moth Book, 266. (C.R.E.)

tristis Edwards. Proc. Phila. Ent. Soc., ii, 511: Moth Book, 262.

ultronia Hübner. Moth Book, 265.

ultronia var. **adriana** Hy. Edwards. Bull. Brook. Ent. Soc., iii, 57.

unijuga Walker. Trans. Am. Ent. Soc., iv, 5: Moth Book, 264.

vidua Smith and Abbot. *viduata.* Trans. Am. Ent. Soc., iv, 3: Moth Book, 261.

Syneda Guenée.

graphica Hübner. Moth Book, 259.

Meliopotis Hübner.

limbolaris Geyer. Moth Book, 258.

Euclidea Ochsenheimer.

cuspidea Hübner. Moth Book, 258.

Drasteria Hübner.

crassiuscula Haworth. Lep. Brit., 259: Moth Book, 257. (C.H.Y.)

erechtea Cramer. Moth Book, 257.

Homopyralis Grote.

contracta Walker. *tactus*. Moth Book, 256.
discalis Grote. Can. Ent., viii, 206.

Melanomma Grote.

auricinctaria Grote. Trans. Am. Ent. Soc., v, 117.

Hyamia Walker.

perditalis Walker. *Spargoloma umbrifascia*. Moth Book, 254.

Pangrapta Hübner.

decoralis Hübner. Moth Book, 254.

Phalænostola Grote.

larentioides Grote. Trans. Am. Ent. Soc., iv, 302: Moth Book, 254.

Cydosia Westwood.

aurivitta Grote and Robinson. Trans. Am. Ent. Soc., ii, 186: Moth Book, 253.

Euherrichia Grote.

mollissima Guenée. Moth Book, 253.

Metathorasa Moore.

monetifera Guenée. Spec. Gén., vi, 295: Moth Book, 252. (F.W.H.)

Tarache Hübner.

candefacta Hübner. *Acontia*. Trans. Am. Ent. Soc., xxvii, 82.
delecta Walker. *Ibid.*, xxvii, 60: Moth Book, 251.
erastrioides Guenée. Trans. Am. Ent. Soc., xxvii, 71: Moth Book, 251.

Characoma Walker.

nilotica Rogenhofer. *Nycteola proteella* Dyar. Jour. N. Y. Ent. Soc., vi, 40.

Sarrothripus Curtis.

revayana Scopoli. *Nycteola revayana.* Ann. Hist. Nat., v, 116.

Chamyris Guenée.

cerintha Treitschke. Moth Book, 250.

Thalpochares Lederer.

fractilinea Smith. Ann. N. Y. Acad. Sci., xviii, 125.

Prothymia Hübner.

semipurpurea Walker. Moth Book, 248.

Lithacodia Hübner.

bellicula Hübner. Moth Book, 248.

Galgula Guenée.

hepara Guenée. Moth Book, 247.
hepara var. **partita** Guenée. Moth Book, 247.

Eustrotia Hübner.

æria Grote. Papilio, i, 11.
albidula Guenée. Moth Book, 247.
apicosa Haworth. *Ibid.*, 247.
carneola Guenée. *Ibid.*, 247.
includens Walker. Cat. Brit. Mus., xii, 813.
muscoscula Guenée. Moth Book, 247.
nigellus Strecker. *immuna.* Ann. N. Y. Acad. Sci., xviii, 124.
puncticosta Smith. *Ibid.*, xviii, 122.
synochitis Grote and Robinson. Trans. Am. Ent. Soc., i, 357: Moth Book, 247.

Phiprosopus Grote.

callitrichoides Grote. Trans. Am. Ent. Soc., iv, 90: Moth Book, 245.

Doryodes Guenée.

bistriaris Geyer. Moth Book, 245.

Rivula Guenée.

propinqualis Guenée. Moth Book, 245.

Amolita Grote.

fessa Grote. Bull. Buff. Soc. Nat. Sci., ii, 158: Moth Book, 244.

Eucalyptera Morrison.

humeralis Smith. Trans. Am. Ent. Soc., xxix, 220. (C.R.E.)

Scoleocampa Guenée.

liburna Geyer. Moth Book, 244.

Alabama Grote.

argillacea Hübner. Cotton-worm moth. Moth Book, 243.

Marasmalus Grote.

inficita Walker. Moth Book, 242.
ventilator Grote. Trans. Am. Ent. Soc., iv, 89. (A.B.C.)

Pæctes Hübner.

abrostoloides Guenée. Moth Book, 241.
oculatrix Guenée. Moth Book, 241.

Ogdoconta Butler.

cinereola Guenée. Moth Book, 241.

Autographa Hübner.

basigera Walker. *Plusia.* Cat. Brit. Mus., xxxiii, 836: Moth Book, 240. (C.H.Y.)
biloba Stephens. *Plusia.* Moth Book, 238.
brassicæ Riley. *Plusia.* Cabbage looper. Cabbage Plusia. *Ibid.*, 238.
falcigera Kirby var. **simplex** Guenée. *Ibid.*, 240.
precationis Guenée. *Ibid.*, 238.

Eosphoropteryx.

thyatiroides Guenée. Moth Book, 237. (A.H.Me.)

Plusia Hübner.

ærea Hübner. Moth Book, 237.
balluca Geyer. *Ibid.*, 237. (H.H.A.)

Panchrysia Hübner.

purpurigera Walker. Moth Book, 236.

Calpe Treitschke.

canadensis Bethune. Proc. Phila. Ent. Soc., iv, 213: Moth Book, 236.

Euthisanotia Hübner.

grata Fabricius. *Eudryas.* Pearl wood-nymph. Jour. N. Y. Ent. Soc., ii, 25: Moth Book, 232.
unio Hübner. *Eudryas.* Beautiful wood-nymph. Jour. N. Y. Ent. Soc., ii, 24: Moth Book, 232.

Psychomorpha Harris.

epimenis Drury. Jour. N. Y. Ent. Soc., ii, 19: Moth Book, 232.

Schinia Hübner.

arcifera Guenée. Spec. Gén., vi, 184: Moth Book, 228.
brevis Grote. Proc. Phila. Ent. Soc., iii, 530: Moth Book, 228.
marginata Haworth. Lep. Brit., 374, 1810: Moth Book, 228.
nundina Drury. Ill. Exot. Ent., i, 36: Moth Book, 227.

Eupanychis Grote.

spinosæ Guenée. *hirtella.* Spec. Gén., vi, 182: Moth Book, 226.

Rhodophora Guenée.

florida Guenée. *Alaria.* Spec. Gén., vi, 171: Moth Book, 224.

Derrima Walker.

stellata Walker. Cat. Brit. Mus., xxii, 770: Moth Book, 224.

Heliothis Ochsenheimer.

obsoleta Fabricius. *armiger.* Cotton boll-worm. Corn ear-worm. Moth Book, 222.

Chloridea Westwood.

virescens Fabricius. *rhexiæ.* Tobacco bud-worm. Rept. Conn. Agr. Expt. Sta., 1909, 367: Moth Book, 222.

Atethmia Hübner.

rectifascia Grote. Proc. Bost. Soc. Nat. Hist., xvi, 242. (H.W.F.)

Ipimorpha Hübner.

pleonectusa Grote. Bull. Buff. Soc. Nat. Sci., i, 191: Moth Book, 220.

Calymnia Hübner.

orina Guenée. Moth Book, 219.

Epiglæa Grote.

decliva Grote. Moth Book, 219. (J.T.K.)

Glæa Hübner.

inulta Grote. Rept. Peab. Acad. Sci., vi, 30: Moth Book, 218. (E.F.)
sericea Morrison. Proc. Bost. Soc. Nat. Hist., xvii, 151; Moth Book, 218. (E.F.)

Scopelosoma Curtis.

ceromatica Grote. Bull. Buff. Soc. Nat. Sci., ii, 70: Moth Book, 218.
devia Grote. Proc. Acad. Nat. Sci., Phila., 1874, 209.
morrisoni Grote. Bull. Buff. Soc. Nat. Sci., ii, 70.
sidus Guenée. Spec. Gén., v, 386.
tristigmata Grote. Can. Ent., ix, 156.
walkeri Grote. Proc. Phila. Ent. Soc., ii, 439: Moth Book, 218.

Orthosia Ochsenheimer.

bicolorago Guenée var. **ferruginoides** Guenée. Spec. Gén., v, 389.
helva Grote. Bull. Buff. Soc. Nat. Sci., ii, 310: Moth Book, 217.
inops Grote. Bull. Geol. Geog. Surv. Terr., vi, 270.
lutosa Andrews. Can. Ent., ix, 99.
ralla Grote and Robinson. Trans. Am. Ent. Soc., i, 346.
rubrescens Walker.

Cosmia Ochsenheimer.

paleacea Esper. Schmett. Eur., pl. 122, f. 504: Moth Book, 217. (C.R.E.)

Fagitana Walker.

littera Guenée. Moth Book, 217.

Tapinostola Lederer.

variana Morrison. Moth Book, 216.

Scoliopteryx Germar.

libatrix Linnæus. Moth Book, 215.

Eucirrœdia Grote.

pampina Guenée. Moth Book, 215.

Conservula Grote.

anodonta Guenée. Moth Book, 215.

Trigonophora Hübner.

periculosa Guenée. Spec. Gén., vi, 65.
periculosa var. **v-brunneum** Grote. Moth Book, 215.

Brotolomia Lederer.

iris Guenée. Moth Book, 215.

Jodia Hübner.

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Pyrrhia Hübner.

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Papaipema Smith.

astuta Bird. Can. Ent., xxxix, 272. (H.B.)
baptisiæ Bird. *Hydrœcia.* *Ibid.*, xxxiv, 109.
cataphracta Grote. *Hydrœcia.* Trans. Am. Ent. Soc., xxvi, 41: Moth Book, 214.
cerussata Grote. Trans. Am. Ent. Soc., xxvi, 38. (H.B.)
duovata Bird. Can. Ent., xxxiv, 115. (H.B.)
duplicata Bird. *Ibid.*, xl, 25. (H.B.)
frigida Smith. Trans. Am. Ent. Soc., xxvi, 39. (H.B.)
impecuniosa Grote. *Ibid.*, xxvi, 42. (H.B.)
inquæsita Grote and Robinson. *Ibid.*, i, 344: Moth Book, 213.
marginidens Guenée. *birdii.* Spec. Gén., v, 123.
maritima Bird. Can. Ent., xli, 59. (H.B.)
nitela Guenée. Trans. Am. Ent. Soc., xxvi, 34.
nitela var. **nebris** Guenée. *Ibid.*, xxvi, 34: Moth Book, 213.
pterisii Bird. Can. Ent. xxxix, 310. (H.B.)
purpurifascia Grote and Robinson. Trans. Am. Ent. Soc., xxvi, 33. (H.B.)
rigida Grote. Can. Ent., ix, 87. (C.R.E.)
rutila Guenée. Trans. Am. Ent. Soc., xxvi, 43.
sciata Bird. Can. Ent., xl, 28. (H.B.)

Gortyna Ochsenheimer.

nictitans Borkhausen. Moth Book, 212.
nictitans var. **americana** Speyer. *atlantica.* Trans. Am. Ent. Soc., xxvi, 18.
velata Walker. *sera.* *Ibid.*, xxvi, 16: Moth Book, 212.

Achatodes Guenée.

zeæ Harris. Moth Book, 212.

Nonagria Ochsenheimer.

oblonga Grote. *subcarnea.* Can. Ent., xv, 175.

Sphida Grote.

obliqua Walker. Moth Book, 211.

Cucullia Schrank.

asteroides Guenée. Moth Book, 208.
convexipennis Grote and Robinson. Trans. Am. Ent. Soc., ii, 201: Moth Book, 208.
speyeri Lintner. Twenty-sixth Rept. N. Y. State Mus., 1872, 168.

Calocampa Stephens.

cineritia Grote. Proc. Acad. Nat. Sci. Phila., 1874, 210.
curvimacula Morrison. Bull. Buff. Soc. Nat. Sci., ii, 191: Moth Book, 208.
nupera Lintner. Bull. Buff. Soc. Nat. Sci., ii, 188: Moth Book, 208.

Xylina Ochsenheimer.

antennata Walker. *cinerea.* Cat. Brit. Mus., xiv, 1733: Moth Book, 206.
bethunei Grote and Robinson. Trans. Am. Ent. Soc., i, 354.
disposita Morrison. Bull. Buff. Soc. Nat. Sci., ii, 116: Moth Book, 206.
fagina Morrison. Bull. Buff. Soc. Nat. Sci., ii, 115.
ferrealis Grote. Rept. Peab. Acad. Sci., vi, 32.
grotei Riley. Papilio, ii, 102.
pexata Grote. Rept. Peab. Acad. Sci., vi, 35: Moth Book, 207.
thaxteri Grote. Bull. Buff. Soc. Nat. Sci., ii, 196: Moth Book, 207.
unimoda Lintner. Ent. Cont., ix, 96: Moth Book, 207.

Tricholita Grote.

signata Walker. Moth Book, 205.

Graphiphora Hübner.

alia Guenée. Moth Book, 204.
furfurata Grote. Proc. Acad. Nat. Sci., Phila., 1874, 201.
oviducta Guenée. Spec. Gén., v, 357: Moth Book, 204. (C.R.E.)
revicta Morrison. Proc. Bost. Soc. Nat. Hist., xviii, 241.
subterminata Smith. Proc. U. S. Nat. Mus., x, 476.

Crocigrapha Grote.

normani Grote. Can. Ent., vi, 115: Moth Book, 204.

Orthodes Guenée.

crenulata Butler. Moth Book, 203.
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vecors Guenée. Spec. Gén., v, 376: Moth Book, 203.

Heliophila Hübner.

Leucania Ochsenheimer.

albilinea Hübner. Moth Book, 201.
commoides Guenée. *Ibid.*, 203.
luteopallens Smith. Proc. U. S. Nat. Mus., xxv, 180.
multilinea Walker. Cat. Brit. Mus., ix, 97: Moth Book, 202.
phragmitidicola Guenée. Spec. Gén., v, 89.
pseudargyria Guenée. Moth Book, 201.
unipuncta Haworth. Army worm. Rept. Conn. Agr. Expt. Sta., 1914, 157: Moth Book, 200.

Nephelodes Guenée.

minians Guenée var. **violans** Guenée. Spec. Gén., v, 130.

Morrisonia Grote.

confusa Hübner. Proc. U. S. Nat. Mus., xv, 85: Moth Book, 197.
sectilis Guenée. *evicta.* Proc. U. S. Nat. Mus., xv, 83: Moth Book, 196.

Mamestra Ochsenheimer.

adjuncta Boisduval. Proc. U. S. Nat. Mus., xvi, 237: Moth Book, 194.
assimilis Morrison. Proc. U. S. Nat. Mus., xvi, 234. (C.R.E.)
congermana Morrison. *Ibid.*, xvi, 229: Moth Book, 193.
cristifera Walker. *lubens.* Proc. U. S. Nat. Mus., xvi, 233.
cuneata Grote. *Ibid.*, xvi, 261.
detracta Walker. *Ibid.*, xiv, 211: Moth Book, 192.
distincta Hübner. Proc. U. S. Nat. Mus., xiv, 212.
goodellii Grote. Can. Ent., vii, 223.
grandis Boisduval. Proc. U. S. Nat. Mus., xvi, 224: Moth Book, 193.
latex Guenée. Spec. Gén., vi, 78.
legitima Grote. Proc. Phila. Ent. Soc., iii, 82.
lilacina Harvey. Moth Book, 194. (H.W.F.)

lorea Guenée. Proc. U. S. Nat. Mus., xvi, 262: Moth Book, 195.
meditata Grote. Proc. U. S. Nat. Mus., xiv, 210: Moth Book, 192.
picta Harris. Proc. U. S. Nat. Mus., xvi, 231: Moth Book, 193.
purpurissata Grote. Proc. Phila. Ent. Soc., iii, 82: Moth Book, 192. (C.R.E.)
renigera Stephens. Proc. U. S. Nat. Mus., xvi, 250: Moth Book, 195.
rosea Harvey. Proc. U. S. Nat. Mus., xvi, 229: Moth Book, 193.
subjuncta Grote and Robinson. Proc. U. S. Nat. Mus., xvi, 223: Moth Book, 193.
trifolii Rottemburg. Proc. U. S. Nat. Mus., xvi, 226: Moth Book, 193.
vicina Grote. Moth Book, 195. (H.W.F.)

Anytus Grote.

privatus Walker. *sculptus.* Moth Book, 191.

Paragrotis Pratt.

bostoniensis Grote. Proc. Acad. Nat. Sci., Phila., 1874, 203.
detersa Walker. *pitychrous.* Cat. Brit. Mus., ix, 212: Moth Book, 188. (E.F.)
insulsa Walker. *Euxoa. Carneades.* Moth Book, 189.
messoria Harris. *Euxoa. Carneades.* U. S. Nat. Mus. Bull., 38, 169: Moth Book, 188.
obeliscoides Guenée. *Euxoa. Carneades.* U. S. Nat. Mus. Bull., 38, 199: Moth Book, 190. (C.R.E.)
perpolita Morrison. *Euxoa. Carneades.* U. S. Nat. Mus. Bull., 38, 151: Moth Book, 188.
redimicula Morrison. *Euxoa. Carneades.* U. S. Nat. Mus. Bull., 38, 202: Moth Book, 190.
tessellata Harris. *Euxoa. Carneades.* U. S. Nat. Mus. Bull., 38, 192: Moth Book, 189.
velleripennis Grote. *Euxoa. Carneades.* U. S. Nat. Mus. Bull., 38, 153: Moth Book, 188.

Porosagrotis Smith.

vetusta Walker. ***muraenula.*** U. S. Nat. Mus. Bull., 38, 212: Moth Book, 187. (E.F.)

Feltia Walker.

annexa Treitschke. U. S. Nat. Mus. Bull., 38, 122: Moth Book, 187.

gladiaria Morrison. U. S. Nat. Mus. Bull., 38, 117: Moth Book, 186.

jaculifera Guenée. U. S. Nat. Mus. Bull., 38, 112.

jaculifera var. **herilis** Grote. *Ibid.*, 38, 113: Moth Book, 186.

subgothica Haworth. U. S. Nat. Mus. Bull., 38, 111: Moth Book, 186.

venerabilis Walker. U. S. Nat. Mus. Bull., 38, 117: Moth Book, 186.

volubilis Harvey. U. S. Nat. Mus. Bull., 38, 121: Moth Book, 186.

Noctua Linnæus.

bicarnea Guenée. U. S. Nat. Mus. Bull., 38, 81: Moth Book, 183.

clandestina Harris. U. S. Nat. Mus. Bull., 38, 94: Moth Book, 184.

c-nigrum Linnæus. U. S. Nat. Mus. Bull., 38, 82: Moth Book, 183.

cynica Smith. Jour. N. Y. Ent. Soc., vi, 101. (C.R.E.)

haruspica Grote. Bull. Buff. Soc. Nat. Sci., ii, 212: Moth Book, 184. (C.H.Y.)

lubricans Guenée. U. S. Nat. Mus. Bull., 38, 96: Moth Book, 185.

normaniana Grote. U. S. Nat. Mus. Bull., 38, 79: Moth Book, 183.

phyllophora Grote. U. S. Nat. Mus. Bull., 38, 85.

plecta Linnæus. *Ibid.*, 38, 89: Moth Book, 184.

smithii Snellen. *baja.* Jour. N. Y. Ent. Soc., vi, 99.

Peridroma Hübner.

incivis Guenée. U. S. Nat. Mus. Bull., 38, 72: Moth Book, 183. (F.W.H.)

margaritosa Haworth var. **saucia** Hübner. Variegated cut worm. U. S. Nat. Mus. Bull., 38, 70: Moth Book, 182.

Agrotis Ochsenheimer.

badinodis Grote. Can. Ent., vi, 13: Moth Book, 181. (E.F.)
geniculata Grote and Robinson. U. S. Nat. Mus. Bull., 38, 64: Moth Book, 182.
ypsilon Rottemburg. Black cut worm. Rept. Conn. Agr. Expt. Sta., 1906, 265: Moth Book, 182.

Epipsilia Hübner.

Pachnobia Guenée.

fishi Grote. Bull. Geol. Surv. Terr., iv, 175.
manifesta Morrison. U. S. Nat. Mus. Bull., 38, 55.
monochromatea Morrison. Ent. News, xxx, 61.
salicarum Walker. U. S. Nat. Mus. Bull., 38, 56: Moth Book, 180.

Semiophora Stephens.

elimata Guenée. U. S. Nat. Mus. Bull., 38, 51: Moth Book, 180. (F.W.H.)
opacifrons Grote. U. S. Nat. Mus. Bull., 38, 97: Moth Book, 180. (C.R.E.)

Eueretagrotis Smith.

sigmoides Guenée. U. S. Nat. Mus. Bull., 38, 48: Moth Book, 179.

Adelphagrotis Smith.

prasina Fabricius. *herbacea*. U. S. Nat. Mus. Bull., 38, 41: Moth Book, 179.

Rhynchagrotis Smith.

alternata Grote. U. S. Nat. Mus. Bull., 38, 23; Moth Book, 179.
anchocelioides Guenée var. **brunneipennis** Grote. Can. Ent., vii, 187: Moth Book, 178.
placida Grote. U. S. Nat. Mus. Bull., 38, 21: Moth Book, 178.

Psaphidia Walker.

grotei Morrison. Bull. Buff. Soc. Nat. Sci., i, 274: Moth Book, 177.
resumens Walker. Cat. Brit. Mus., xxxii, 448: Moth Book, 177.

Eutolype Grote.

bombyciformis Smith. Proc. U. S. Nat. Mus., xv, 59: Moth Book, 177.

rolandi Grote. *vernalis*. Proc. U. S. Nat. Mus., xv, 60.

Copipanolis Grote.

cubilis Grote. Proc. U. S. Nat. Mus., xv, 63: Moth Book, 177.

Adita Grote.

chionanthi Smith and Abbot. Lep. Ins. Ga., ii, 195: Moth Book, 177. (C.R.E.)

Lepipolys Guenée.

perscripta Guenée. Spec. Gen., vi, 174.

Magusa Walker.

dissidens Felder. *divaricata*. Proc. Wash. Ent. Soc., iv, 453: Moth Book, 175. (C.R.E.)

Laphygma Guenée.

frugiperda Smith and Abbot. Fall army worm. Rept. Conn. Agr. Expt. Sta., 1912, 284: Moth Book, 174.

Prodenia Guenée.

ornithogalli Guenée. *lineatella*. Spec. Gén., v, 163: Moth Book, 174.

ornithogalli var. **eudiopta** Guenée. Spec. Gén., v, 164. (E.F.)

Heliotropha Lederer.

reniformis Grote. Can. Ent., vi, 14: Moth Book, 173.

reniformis var. **atra** Grote. Proc. Acad. Nat. Sci., Phila., 1874, 200: Moth Book, 173.

Pyrophila Hübner.

pyramidoides Guenée. Spec. Gén., vi, 413: Moth Book, 173.

Actinotia Hübner.

ramosula Guenée. Spec. Gén., vi, 114: Moth Book, 172.

Dipterygia Stephens.

scabriuscula Linnæus. Syst. Nat., 516: Moth Book, 172.

Euplexia Stephens.

lucipara Linnæus. Syst. Nat., 518: Moth Book, 172.

Feralia Grote.

jocosa Guenée. Spec. Gén., v, 37: Moth Book, 171.

Hyppa Duponchel.

xylinoides Guenée. Spec. Gén., vi, 106: Moth Book, 171.

Hadena Schrank.

apamiformis Guenée. Proc. U. S. Nat. Mus., xiii, 416. (C.R.E.)
arctica Boisduval. *Ibid.*, xiii, 430: Moth Book, 169.
bridghami Grote and Robinson. Proc. Phila. Ent. Soc., vi, 17: Moth Book, 166.
burgessi Morrison. Proc. U. S. Nat. Mus., xiii, 412: Moth Book, 168.
cariosa Guenée. Proc. U. S. Nat. Mus., xiii, 438.
cogitata Smith. *Ibid.*, xiii, 421. (E.F.)
devastatrix Brace. *Ibid.*, xiii, 426: Moth Book, 169.
diversicolor Morrison. Proc. Bost. Soc. Nat. Hist., xvii, 132.
dubitans Walker. *sputatrix*. Proc. U. S. Nat. Mus., xiii, 422: Moth Book, 169.
finitima Guenée. Proc. U. S. Nat. Mus., xiii, 419. (C.H.Y.)
fractilinen Grote var. **vulgivaga** Morrison. Can. Ent., vi, 15.
impulsa Guenée. *Ibid.*, xiii, 425. (H.W.F.)
lignicolor Guenée. *Ibid.*, xiii, 442: Moth Book, 169.
mactata Guenée. Spec. Gén., v, 207: Moth Book, 167. (C.R.E.)
miseloides Guenée. Moth Book, 167.
misera Grote. Bull. Geol. Geog. Surv. Terr., vi, 582.
modica Guenée. Spec. Gén., v, 207: Moth Book, 167.
nigrior Smith. Proc. U. S. Nat. Mus., xiii, 437: Moth Book, 169. (C.R.E.)
passer Guenée. Proc. U. S. Nat. Mus., xiii, 411.
remissa Hübner. *Ibid.*, xiii, 414. (C.R.E.)
semicana Walker. Cat. Brit. Mus., xxxii, 675.
semicana var. **fractilinea** Grote. Can. Ent., vi, 15: Moth Book, 168.
turbulenta Hübner. Moth Book, 167.
verbascoides Guenée. Proc. U. S. Nat. Mus., xiii, 437: Moth Book, 169.
viridimusca Smith. Can. Ent., xxxi, 264.
vultuosa Grote. Proc. U. S. Nat. Mus., xiii, 416: Moth Book, 168 (C.H.Y.)

Hillia Grote.

algens Grote. Can. Ent., x, 236.
discinigra Walker. Cat. Brit. Mus., ix, 27: Moth Book, 166. (C.R.E.)

Oligia Hübner.

chalcedonica Hübner. Ent. Am., v, 148.
festivoides Guenée. Moth Book, 165: Ent. Am., v, 147.
nucicolora Guenée. Spec. Gén., v, 24.

Perigea Guenée.

sutor Guenée. Spec. Gén., v, 231.
vecors Guenée. *luxa*. *Ibid.*, v, 230: Moth Book, 165.
xanthoides Guenée. Spec. Gén., v, 227: Moth Book, 165.

Caradrina Ochsenheimer.

miranda Grote (?). Bull. Buff. Soc. Nat. Sci., i, 11.

Anorthodes Smith.

prima Smith. Trans. Am. Ent. Soc., xviii, 115: Moth Book, 164. (C.R.E.)

Balsa Walker.

malana Fitch. *Nolophana obliquifera*. Ins. N. Y., ii, 244.
tristigella Walker. *zelleri*. Cat. Brit. Mus., xxxv, 1734.

Platysenta Grote.

videns Guenée. Spec. Gén., v, 78: Moth Book, 163.

Catabena Walker.

lineolata Walker. Cat. Brit. Mus., xxxii, 631: Moth Book, 163.

Baileya Grote.

dormitans Guenée. Spec. Gén., v, 15.
doubledayi Guenée. *Ibid.*, v, 15: Moth Book, 162.
opthalmica Guenée. Spec. Gén., v, 15: Moth Book, 162.

Chytonix Grote.

palliatricula Guenée. Spec. Gén., v, 26: Moth Book, 161.

Polygrammata Hübner.

hebraicum Hübner. Zutr. Exot. Schmett., f. 25: Moth Book, 160.

Dipthera Hübner.

fallax Herrich-Schæffer. Exot. Schmett., f. 211: Moth Book, 160.

Micrococlia Guenée.

dipteroides Guenée. Proc. Phila., Ent. Soc., iii, 78: Moth Book, 160.

dipteroides var. **obliterata** Grote. Proc. Phila. Ent. Soc., iii, 79.

Arsilonche Lederer.

albovenosa Goeze. Proc. U. S. Nat. Mus., xxi, 175: Moth Book, 159.

Apatela Hübner.

Acronycta Ochsenheimer.

americana Harris. Proc. U. S. Nat. Mus., xxi, 44: Moth Book, 153.

clarescens Guenée. Proc. U. S. Nat. Mus., xxi, 140.

dactylina Grote. *Ibid.*, xxi, 51: Moth Book, 153.

distans Grote. Can. Ent., xi, 58. (C.R.E.)

furcifera Guenée. Proc. U. S. Nat. Mus., xxi, 85: Moth Book, 155.

hæsitata Grote. Proc. U. S. Nat. Mus., xxi, 140.

hamamelis Guenée. *Ibid.*, xxi, 141.

hasta Guenée. *Ibid.*, xxi, 87.

hastulifera Smith and Abbot. *Ibid.*, xxi, 47.

impleta Walker. *luteicoma*. Moth Book, 157.

impressa Walker. Proc. U. S. Nat. Mus., xxi, 159: Moth Book, 157.

innotata Guenée. Proc. U. S. Nat. Mus., xxi, 73: Moth Book, 155. (C.R.E.)

interrupta Guenée. *occidentalis*. Proc. U. S. Nat. Mus., xxi, 79: Moth Book, 155.

lobeliæ Guenée. Proc. U. S. Nat. Mus., xxi, 82: Moth Book, 155.

noctivaga Grote. Proc. U. S. Nat. Mus., xxi, 156: Moth Book, 157.

oblinita Smith and Abbot. Proc. U. S. Nat. Mus., xxi, 169: Moth Book, 157.

ovata Grote. Proc. U. S. Nat. Mus., xxi, 135. (C.R.E.)

pruni Harris. *Ibid.*, xxi, 123.

retardata Walker. *Ibid.*, xxi, 145.

sperata Grote. *Ibid.*, xxi, 154.

vinnula Grote. *Ibid.*, xxi, 93: Moth Book, 156.

xyliniformis Guenée. *longa*. Proc. U. S. Nat. Mus., xxi, 166.

Charadra Walker.

deridens Guenée. Proc. U. S. Nat. Mus., xxi, 25: Moth Book, 152.

Demas Stephens.

flavicornis Smith. Bull. Brook. Ent. Soc., vii, 3.

propinquilinea Grote. *Charadra.* Trans. Am. Ent. Soc., iv, 293.

Family AGARISTIDÆ.

Alypia Hübner.

octomaculata Fabricius. Eight-spotted forester. Bull. Am. Mus. Nat. Hist., x, 357: Moth Book, 144.

Family ARCTIIDÆ.

Halisidota Hübner.

caryæ Harris. Hickory tussock moth. Rept. Conn. Agr. Expt. Sta., 1907, 332: Moth Book, 138.

tessellaris Smith and Abbot. Bull. Am. Mus. Hist., x, 370: Moth Book, 137.

Euchætias Lyman.

egle Drury. Milk-weed moth. Bull. Am. Mus. Nat. Hist., x, 368: Moth Book, 135.

Ammalo Walker.

tenera Hübner. *collaris.* Bull. Am. Mus. Nat. Hist., x, 368.

Apantesis Walker.

anna Grote var. **persephone** Grote. Proc. Ent. Soc., Phila., ii, 433.

arge Drury. *Arctia.* Bull. Am. Mus. Nat. Hist., x, 379: Moth Book, 130.

figurata Drury. Moth Book, 132. (H.W.F.)

intermedia Stretch. Bull. Am. Mus. Nat. Hist., x, 379: Moth Book, 129. (C.H.Y.)

michabo Grote. *Arctia.* Bull. Am. Mus. Nat. Hist., x, 380: Moth Book, 130. (A.H.Me.)

nais Drury. *Arctia.* Bull. Am. Mus. Nat. Hist., x, 381.

parthenice Kirby. *Arctia. Ibid.*, x, 379: Moth Book, 129.

phyllira Drury. *Arctia.* Bull. Am. Mus. Nat. Hist., x, 380: Moth Book, 132.

virgo Linnæus. *Arctia.* Bull. Am. Mus. Nat. Hist., x, 377: Moth Book, 129.

virguncula Kirby. *Arctia.* Bull. Am. Mus. Nat. Hist., x, 378: Moth Book, 131.

vittata Fabricius. *Arctia.* Hist., x, 381: Bull. Am. Mus. Nat. Moth Book, 132. (A.H.Me.)

Diacrisia Hübner.

latipennis Stretch. *Spilosoma.* Bull. Am. Mus. Nat. Hist., x, 375: Moth Book, 128.

virginica Fabricius. Virgin tiger moth. Bull. Am. Mus. Nat. Hist., x, 374: Moth Book, 127.

Phragmatobia Stephens.

fuliginosa Linnæus. *rubricosa.* Bull. Am. Mus. Nat. Hist., x, 373: Moth Book, 126.

Isia Walker.

isabella Smith and Abbot. *Pyrrharctia.* Isabella tiger moth. Bull. Am. Mus. Nat. Hist., x, 373: Moth Book, 125.

Hyphantria Harris.

cunea Drury. Fall web worm. Bull. Am. Mus. Nat. Hist., x, 376: Moth Book, 123.

textor Harris. Rept. Ins. Mass., 255: Moth Book, 124.

Estigmene Hübner.

acræa Drury. *Leucarctia.* Salt march caterpillar. Bull. Am. Mus. Nat. Hist., x, 372: Moth Book, 123.

congrua Walker. *antigone.* Cat. Brit. Mus., iii, 669: Moth Book, 123. (C.H.Y.)

Ecpantheria Hübner.

deflorata Fabricius. *scribona. ocularia.* Bull. Am. Mus. Nat. Hist., x, 372: Moth Book, 120.

Haploa Hübner.

clymene Brown. *Callimorpha.* Bull. Am. Mus. Nat. Hist., x, 366: Moth Book, 118.

lecontei Boisduval var. **militaris** Harris. Bull. Am. Mus. Nat. Hist., x, 366: Moth Book, 118.

Utetheisa Hübner.

bella Linnæus. Bull. Am. Mus. Nat. Hist., x, 367: Moth Book, 117.

Eubaphe Hübner.

aurantiaca Hübner var. **ferruginosa** Walker. *Homomelina.* Bull. Am. Mus. Nat. Hist., x, 365.

immaculata Reakirt. Proc. Phila. Ent. Soc., ii, 372.

immaculata var. **trimaculosa** Reakirt. Proc. Ent. Soc., Phila., ii, 372.

Rœselia Hübner.

minuscula Zeller var. **phylla** Dyar. Jour. N. Y. Ent. Soc., vi, 43.

Nigetia Walker.

formosalis Walker. *melanopa.* Cat. Brit. Mus., xxxiv, 1506: Moth Book, 358. (C.R.E.)

Celama Walker.

clethræ Dyar. *Nola.* Can. Ent., xxxi, 62.

ovilla Grote. *Nola.* *Ibid.*, vii, 221: Moth Book, 357.

pustulata Walker. *nigrofasciata.* Cat. Brit. Mus., xxxiii, 795: Moth Book, 357. (C.R.E.)

triquetrana Fitch. Jour. N. Y. Ent. Soc., vi, 42.

Family LITHOSIIDÆ.

Illice Walker.

subjecta Walker. *Cisthene.* Bull. Am. Mus. Nat. Hist., x, 363: Moth Book, 109.

Clemensia Packard.

albata Packard. Bull. Am. Mus. Nat. Hist., x, 361: Moth Book, 108.

Hypoprepia Hübner.

fucosa Hübner. Bull. Am. Mus. Nat. Hist., x, 362: Moth Book, 106.

miniata Kirby. Bull. Am. Mus. Nat. Hist., x, 362: Moth Book, 106.

Crambidia Packard.

pallida Packard. Proc. Phila. Ent. Soc., iii, 99.

Family SYNTOMIDÆ.

Lycomorpha Harris.

pholus Drury. Bull. Am. Mus. Nat. Hist., x, 355: Moth Book, 101.

Scepsis Walker.

fulvicollis Hübner. Bull. Am. Mus. Nat. Hist., x, 353: Moth Book, 101.

Ctenucha Kirby.

virginica Charpentier. Moth Book, 102.

Family CERATOCAMPIDÆ.

Basilona Boisduval.

imperialis Drury. *Eacles.* Imperial moth. Bull. Am. Mus. Nat. Hist., x, 442: Moth Book, 97.

Citheronia Hübner.

regalis Fabricius. Regal moth. Bull. Am. Mus. Nat. Hist., x, 441: Moth Book, 97.

Anisota Hübner.

rubicunda Fabricius. *Dryocampa.* Green-striped maple worm. Bull. Am. Mus. Nat. Hist., x, 440: Moth Book, 95.

senatoria Smith and Abbot. Orange-striped oak worm. Senator moth. Bull. Am. Mus. Nat. Hist., x, 439.

stigma Fabricius. *Ibid.*, x, 439: Moth Book, 94.

virginiensis Drury. Bull. Am. Mus. Nat. Hist., x, 440: Moth Book, 95.

Family SATURNIIDÆ.

Hemileuca Walker.

maia Drury. Bull. Am. Mus. Nat. Hist., x, 438: Moth Book, 91. (A.W.P.)

Automeris Hübner.

io Fabricius. *Hyperchiria.* Io moth. Bull. Am. Mus. Nat. Hist., x, 438: Moth Book, 89.

Telea Hübner.

polyphemus Cramer. American silk-worm moth. Bull. Am. Mus. Nat. Hist., x, 436: Moth Book, 87.

Tropæa Hübner.

luna Linnæus. *Actias.* Luna moth. Bull. Am. Mus. Nat. Hist., x, 437: Moth Book, 87.

Callosamia Packard.

angulifera Walker. Tulip tree silk moth. Bull. Am. Mus. Nat. Hist., x, 436: Moth Book, 86.

promethea Drury. Promethea moth. Bull. Am. Mus. Nat. Hist., x, 435: Moth Book, 84.

Samia Hübner.

cecropia Linnæus. *Attacus.* Cecropia moth. Bull. Am. Mus. Nat. Hist., x, 435: Moth Book, 83.

Philosamia Grote.

cynthia Drury. Cynthia moth. Bull. Am. Mus. Nat. Hist., x, 434: Moth Book, 82.

Family SPHINGIDÆ.

Cressonia Grote and Robinson.

juglandis Smith and Abbot. Bull. Am. Mus. Nat. Hist., vii, 317: Moth Book, 57.

Paonias Hübner.

astylus Drury. *Calasymbolus.* Bull. Am. Mus. Nat. Hist., vii, 316: Moth Book, 56. (C.R.E.)

excæcatus Smith and Abbot. Bull. Am. Mus. Nat. Hist., vii, 314: Moth Book, 56.

myops Smith and Abbot. Bull. Am. Mus. Nat. Hist., vii, 315: Moth Book, 56.

Smerinthus Latreille.

jamaicensis Drury. *geminatus.* Bull. Am. Mus. Nat. Hist., vii, 313: Moth Book, 55.

Marumba Moore.

modesta Harris. *Triptogon. Pachysphinx.* Bull. Am. Mus. Nat. Hist., vii, 312: Moth Book, 57. (H.H.A.), (A.B.C.), (F.W.H.)

Lapara Walker.

bombycoides Walker. *Ellema harrisii.* Bull. Am. Mus. Nat. Hist., vii, 310: Moth Book, 53. (H.H.A.)

coniferarum Smith and Abbot. Moth Book, 53.

Ceratomia Harris.

amyntor Geyer. *quadricornis.* Bull. Am. Mus. Nat. Hist., vii, 307: Moth Book, 47.

undulosa Walker. Bull. Am. Mus. Nat. Hist., vii, 308: Moth Book, 48. (A.H.Me.)

Chlænogramma Smith.

jasminearum Boisduval. Bull. Am. Mus. Nat. Hist., 306: Moth Book, 46.

Dolba Walker.

hylæus Drury. Bull. Am. Mus. Nat. Hist., vii, 309: Moth Book, 46.

Sphinx Linnæus.

chersis Hübner. *Hyloicus.* Bull. Am. Mus. Nat. Hist., vii, 303: Moth Book, 50.

convolvuli Linnæus var. **cingulata** Fabricius. *Herse.* Bull. Am. Mus. Nat. Hist., vii, 298: Moth Book, 43. (H.H.A.)

drupiferarum Smith and Abbot. Bull. Am. Mus Nat. Hist., vii, 300: Moth Book, 52.

eremitis Hübner. Bull. Am. Mus. Nat. Hist., vii, 304: Moth Book, 49. (A.H.Me.) (G.D.)

gordius Stoll. Bull. Am. Mus. Nat. Hist., vii, 302: Moth Book, 51.

kalmiæ Smith and Abbot. Bull. Am. Mus. Nat. Hist., vii, 301: Moth Book, 51.

luscitiosa Clemens. Bull. Am. Mus. Nat. Hist., vii, 302: Moth Book, 52.

Phlegethontius Hübner.

quinquemaculatus Haworth. *Protoparce celeus* Hübner. Northern tobacco or tomato worm. Rept. Conn. Agr. Expt. Sta., 1906, 269: Moth Book, 45.

sexta Johanssen. *Protoparce carolina* Linnæus. Southern tobacco or tomato worm. Rept. Conn. Agr. Expt. Sta., 1906, 269: Moth Book, 45.

Ampelophaga Bremer and Grey.

chœrilus Cramer. *Darapsa. Pholus.* Bull. Mus. Nat. Hist., vii, 291: Moth Book, 68.

myron Cramer. Bull. Am. Mus. Nat. Hist., vii, 292: Moth Book, 68.

versicolor Harris. Bull. Am. Mus. Nat. Hist., vii, 293: Moth Book, 69.

Pholus Hübner.

achemon Drury. Bull. Am. Mus. Nat. Hist., vii, 289: Moth Book, 66. (H.M.R.)

pandorus Hübner. Bull. Am. Mus. Nat. Hist., vii, 288: Moth Book, 65. (A.H.Me.)

Thereta Hübner.

tersa Linnæus. *Chœrocampa. Xylophanes.* Bull. Am. Mus. Nat. Hist., vii, 287: Moth Book, 75. (R.H.) (H.M.R.)

Deilephila Ochsenheimer.

lineata Fabricius. *Celerio.* White-lined sphinx. Bull. Am. Mus. Nat. Hist., vii, 285: Moth Book, 76.

Deidamia Clemens.

inscriptum Harris. Bull. Am. Mus. Nat. Hist., vii, 284: Moth Book, 71.

Sphecodina Blanchard.

abbotii Swainson. *Thyreus.* Abbot sphinx. Bull. Am. Mus. Nat. Hist., vii, 283: Moth Book, 70.

Amphion Hübner.

nessus Cramer. Bull. Am. Mus. Nat. Hist, vii, 282: Moth Book, 72.

Hemaris Dalman.

diffinis Boisduval. *Hæmorrhagia.* Bull. Am. Mus. Nat. Hist., vii, 278: Moth Book, 63.

gracilis Grote and Robinson. Bull. Am. Mus. Nat. Hist., vii, 278: Moth Book, 63.

thysbe Fabricius. Bull. Am. Mus. Nat. Hist., vii, 277: Moth Book, 62.

thysbe var. **ruficaudis** Kirby. Faun. Bor. Am., iv, 303.

Suborder **RHOPALOCERA.**

Butterflies.

Family HESPERIIDÆ.

Thanaos Boisduval.

icelus Lintner. Dreamy dusky-wing. Comst. Butt., 298.

juvenalis Fabricius. Juvenal's dusky-wing. *Ibid.,* 300.

martialis Scudder. Martial's dusky-wing. *Ibid.,* 299.

persius Scudder. Persius' dusky-wing. *Ibid.,* 299.

Pholisora Scudder.

catullus Fabricius. Sooty-wing. Comst. Butt., 297.

Thorybes Scudder.

bathyllus Smith and Abbot. *Eudamus.* Southern cloudy-wing. Comst. Butt., 295.

pylades Scudder. Northern cloudy-wing. *Ibid.,* 296.

Achlarus Scudder.

lycidas Smith and Abbot. *Eudamus.* Hoary-edge. Comst. Butt., 295.

Epargyreus Hübner.

tityrus Fabricius. *Eudamus.* Silver-spotted skipper. Comst. Butt., 293.

Eudamus Swainson.

proteus Linnæus. Long-tailed skipper. Comst. Butt., 292. (S.I.S.)

Phycanassa Scudder.

vitellius Fabricius. *delaware. logan.* Vitellius skipper. Comst. Butt., 288. (C.H.Y.) (G.D.)

Limochroes Scudder.

bimacula Grote and Robinson. *Pamphila.* Ann. N. Y. Lyc. Nat. Hist., viii, 433.

manataaqua Scudder. Cross-line skipper. Comst. Butt., 286. (F.W.H.)

pontiac Edwards. Black-dash. *Ibid.,* 285.

Euphyes Scudder.

verna Edwards. *Pamphila.* Little glass-wing. Comst. Butt., 283.

vestris Boisduval var. **metacomet** Harris. *Ibid.,* 283.

Polites Scudder.

peckius Kirby. *Pamphila.* Yellow spot. Comst. Butt., 282.

Thymelicus Hübner.

cernes Boisduval and LeConte. Tawny-edged skipper. Comst. Butt., 281.

mystic Scudder. Long dash. *Ibid.,* 281.

otho Smith and Abbot. Otho skipper. *Ibid.,* 279.

Erynnis Schrank.

metea Scudder. Cobweb skipper. Comst. Butt., 277.
sassicus Harris. *Pamphila.* Indian skipper. *Ibid.,* 276.

Atrytone Scudder.

hobomok Harris. *Pamphila.* Mormon. Comst. Butt., 275.
hobomok var. **pocahontas** Scudder. *Ibid.,* 275.
zabulon Boisduval and Le Conte. Zabulon skipper. *Ibid.,* 274.

Poanes Scudder.

massasoit Scudder. *Pamphila.* Mulberry wing. Comst. Butt., 273.

Ancyloxypha Felder.

numitor Fabricius. Least skipper. Comst. Butt., 272.

Amblyscirtes Scudder.

vialis Edwards. Roadside skipper. Comst. Butt., 270. (F.W.H.)

Family LYCÆNIDÆ.

Everes Hübner.

comyntas Godart. Tailed blue. Comst. Butt., 204.

Cyaniris Dalman.

ladon Cramer. var. **lucia** Kirby. Spring azure. Comst. Butt., 249.
ladon var. **marginata** Edwards. *Ibid.,* 249.
ladon var. **neglecta** Edwards. *Ibid.,* 250.

Heodes Dalman.

hypophlæas Boisduval. *Chrysophanus.* American copper. Comst. Butt., 241.
hypophlæas var. **fasciata** Strecker.

Chrysophanus Hübner.

thoë Boisduval. Bronze copper. Comst. Butt., 239.

Feniseca Grote.

tarquinius Fabricius. Wanderer. Comst. Butt., 237.

Strymon Hübner.

titus Fabricius. *Thecla.* Coral hair-streak. Comst. Butt., 234.

Incisalia Minot.

irus Godart. Hoary elfin. Comst. Butt., 233. (J.T.K.)
niphon Hübner. Banded elfin. *Ibid.*, 234. (R.H.)

Mitoura Scudder.

damon Cramer. *smilacis.* Comst. Butt., 229.

Thecla Fabricius.

acadica Edwards. Acadian hair-streak. Comst. Butt., 224. (R.H.)
calanus Hübner. Banded hair-streak. *Ibid.*, 226.
edwardsii Saunders. Edwards' hair-streak. Butterfly Book, 243. (J.T.K.)
liparops Boisduval and Le Conte. *strigosa.* Striped hair-streak. Comst. Butt., 228. (R.H.)

Uranotes Scudder.

melinus Hübner. Gray hair-streak. Comst. Butt., 223.

Family LIBYTHEIDÆ.

Hypatus Hübner.

bachmani Kirtland. *Libythea.* Snout butterfly. Comst. Butt., 210.

Family LYMNADIDÆ.

Anosia Hübner.

plexippus Linnæus. *Danais archippus.* Monarch. Milkweed butterfly. Comst. Butt., 204.

Family AGAPETIDÆ.

Cissa Doubleday.

eurytus Fabricius. *Neonympha.* Little wood-satyr. Comst. Butt., 197.

Satyrodes Scudder.

canthus Linnæus. *Neonympha.* Eyed brown. Comst. Butt., 191.

Enodia Hübner.

portlandia Fabricius. *Debis.* Pearly eye. Comst. Butt., 189. (H.H.A.)

Cercyonis Speyer.

alope Fabricius. *satyrus.* Blue-eyed grayling. Comst. Butt., 184.

alope var. **nephele** Kirby. Dull-eyed grayling. *Ibid.,* 185.

Family NYMPHALIDÆ.

Basilarchia Scudder.

archippus Cramer. *Limenitis dissippus.* Viceroy. Comst. Butt., 170.

arthemis Drury. Banded purple. *Ibid.,* 167. (H.H.A.)

arthemis var. **proserpina** Edwards. Hybrid purple. *Ibid.,* 170. (J.T.K.)

astyanax Fabricius. *ursula.* Red-spotted purple. *Ibid.,* 166.

Junonia Hübner.

cœnia Hübner. Buckeye. Comst. Butt., 160.

Vanessa Fabricius.

atalanta Linnæus. *Pyrameis.* Red admiral. Comst. Butt., 154.

cardui Linnæus. Thistle butterfly. Cosmopolite. *Ibid.,* 158.

huntera Fabricius. Painted beauty. *Ibid.,* 156.

Aglais Dalman.

milberti Godart. *Vanessa.* American tortoise-shell. Comst. Butt., 151.

Euvanessa Scudder.

antiopa Linnæus. *Vanessa.* Mourning cloak. Comst. Butt., 148.

Eugonia Hübner.

j-album Boisduval and Le Conte. *Grapta.* Compton tortoise. Comst. Butt., 146.

Polygonia Hübner.

comma Harris. *Grapta harrisii.* Hop-merchant. Comst. Butt., 140.

faunus Edwards. *Grapta.* Green comma. *Ibid.,* 138.

interrogationis Fabricius. *Grapta.* Violet-tip. *Ibid.,* 134.

interrogationis var. **umbrosa** Lintner. *Ibid.,* 135.

progne Cramer. *Grapta.* Gray comma. *Ibid.,* 143.

Phyciodes Hübner.

tharos Drury. Pearl crescent. Comst. Butt., 129.
tharos var. **morpheus** Fabricius. *Ibid.*, 129.

Charidryas Scudder.

nycteis Doubleday and Hewitson. Silver crescent. Comst. Butt., 127. (R.H.)

Cinclidia Hübner.

harrisii Scudder. Harris' butterfly. Comst. Butt., 126. (H.H.A.)

Euphydryas Scudder.

phaeton Drury. *Melitæa.* Baltimore. Comst. Butt., 125.

Brenthis Hübner.

bellona Fabricius. *Argynnis.* Meadow fritillary. Comst. Butt., 119.
myrina Cramer. *Argynnis.* Silver-bordered fritillary. *Ibid.*, 122.

Argynnis Fabricius.

aphrodite Fabricius. Silver-spot fritillary. Comst. Butt., 117.
atlantis Edwards. Mountain silver spot. *Ibid.*, 118. (F.W.H.)
cybele Fabricius. Great spangled fritillary. *Ibid.*, 114.

Speyeria Scudder.

idalia Drury. *Argynnis.* Regal fritillary. Comst. Butt., 112.

Euptoieta Doubleday.

claudia Cramer. Variegated fritillary. Comst. Butt., 109.

Family PIERIDÆ.

Eurema Hübner.

euterpe Méné. *Terias lisa.* Little sulphur. Comst. Butt., 98.
euterpe var. **alba** Strecker. Cat. Macrolep., 85.

Eurymus Swainson.

philodice Godart. *Colias.* Clouded sulphur. Comst. Butt., 92.

Zerene Hübner.

cæsonia Stoll. Dog's head butterfly. Comst. Butt., 90.

Callidryas Boisduval and LeConte.

eubule Linnæus. *Catopsilia.* Cloudless sulphur. Comst. Butt., 88.

Synchloë Hübner.

genutia Fabricius. *Anthocaris.* Falcate orange-tip. Comst. Butt., 82.

Pontia Fabricius.

Pieris Schrank.

napi Linnæus var. **oleracea** Harris. Ins. Inj. Veg., 270.
napi var. **virginiensis** Edwards. Comst. Butt., 76. (H.L.J.)
protodice Boisduval and Le Conte. *Pieris.* Checkered white. Southern cabbage butterfly. *Ibid.,* 73.
rapæ Linnæus. Imported cabbage butterfly. *Ibid.,* 78.
rapæ var. **immaculata** Skinner and Aaron. Can. Ent. xxi, 128.

Family PAPILIONIDÆ.

Laertias Hübner.

philenor Linnæus. *Papilio.* Blue swallow-tail. Comst. Butt., 66.

Papilio Linnæus.

glaucus Linnæus var. **turnus** Linnæus. Tiger swallow-tail. Comst. Butt., 51.
polyxenes Fabricius. *asterias.* Black swallow-tail. Celery butterfly. *Ibid.,* 62.
thoas Linnæus. *cresphontes.* Giant swallow-tail. Orange dog. *Ibid.,* 56.
troilus Linnæus. Green-clouded swallow-tail. *Ibid.,* 59.

Iphidicles Hübner.

ajax Linnæus. *Papilio.* Zebra swallow-tail. Comst. Butt., 49. (F.W.H.)

Order **SIPHONAPTERA.**

Fleas.

Family PULICIDÆ.

Ctenocephalus Kolenati.

canis Curtis. *Pulex serraticeps.* Common cat and dog flea. Bur. Ent., Bull. 5, New ser., 150.

Order **DIPTERA.**

Flies, Mosquitoes, etc.

Family TIPULIDÆ.

Geranomyia Haliday.

canadensis Westwood. Mon. N. A. Dipt., iv, 80.
distincta Doane. Jour. N. Y. Ent. Soc., viii, 186.
rostrata Say. Compl. Writ., ii, 47. (C.W.J.)

Rhipidia Meigen.

domestica Osten Sacken. Mon. N. A. Dipt., iv, 84. (C.W.J.)
fidelis Osten Sacken. *Ibid.,* iv, 83.
maculata Meigen. *Ibid.,* iv, 82.

Discobola Osten Sacken.

argus Say. Compl. Writ., i, 243.

Dicranomyia Stephens.

badia Walker. Mon. N. A. Dipt., iv, 72. (Ald. Cat.)
hæretica Osten Sacken. *Ibid.,* iv, 70.
immodesta Osten Sacken. *Ibid.,* iv, 62.
liberta Osten Sacken. *Ibid.,* iv, 69.
longipennis Schummel. *Ibid.,* iv, 61.
simulans Walker. List., i, 45. (C.W.J.)

Limnobia Meigen.

immatura Osten Sacken. *Ibid.,* iv, 89. (H.L.J.)
indigena Osten Sacken. Mon. N. A. Dipt., iv, 94. (C.W.J.)
triocellata Osten Sacken. *Ibid.,* iv, 92. (C.W.J.)

Toxorhina Loew.

muliebris Osten Sacken. Mon. N. A. Dipt., iv, 115.

Rhamphidia Meigen.

flavipes Macquart. Dipt. Exot. (Suppl.), v, 17. (C.W.J.)

Elephantomyia Osten Sacken.

westwoodi Osten Sacken. Mon. N. A. Dipt., iv, 109. (C.W.J.)

Atarba Osten Sacken.

picticornis Osten Sacken. Mon. N. A. Dipt., iv, 128.

Teucholabis Osten Sacken.

complexa Osten Sacken. Mon. N. A. Dipt., iv, 132.

Antocha Osten Sacken.

saxicola Osten Sacken. *opalizans*. Mon. N. A. Dipt., iv, 126. (C.W.J.)

Ormosia Rondani.

luteola Dietz. *Rhypholophus*. Trans. Am. Ent. Soc., xlii, 138. (C.R.E.)

monticola Osten Sacken. *Rhypholophus*. Mon. N. A. Dipt., iv, 145.

pygmæa Alexander. *pilosa* Dietz. *Rhypholophus*. Trans. Am. Ent. Soc., xlii, 138. (C.R.E.)

Erioptera Meigen.

armata Osten Sacken. Mon. N. A. Dipt., iv, 160. (C.W.J.)
armillaris Osten Sacken. *Ibid.*, iv, 158.
caloptera Say. Compl. Writ., ii, 44.
chlorophylla Osten Sacken. Mon. N. A. Dipt., iv, 157. (C.W.J.)
dulcis Osten Sacken. West. Dipt. 198. (C.W.J.)
needhami Alexander. Can. Ent., l, 383.
parva Osten Sacken. Mon. N. A. Dipt., iv, 162.
septemtrionalis Osten Sacken. *Ibid.*, iv, 162.
straminea Osten Sacken. *Ibid.*, iv, 157.
venusta Osten Sacken. *Ibid.*, iv, 158. (C.W.J.)
vespertina Osten Sacken. *Ibid.*, iv, 157.

Molophilus Curtis.

hirtipennis Osten Sacken. Mon. N. A. Dipt., iv, 163.

Gonomyia Osten Sacken.

blanda Osten Sacken. Mon. N. A. Dipt., iv, 182.
cognotella Osten Sacken. *Ibid.*, iv, 181.
subcinerea Osten Sacken. *Ibid.*, iv, 181. (C.W.J.)
sulphurella Osten Sacken. *Ibid.*, iv, 180. (C.W.J.)

Symplecta Meigen.

Helobia St. Fargeau.

hybrida Meigen. Syst. Beschr., vi, 282. (H.L.J.)

Trichocera Meigen.

bimacula Walker. Mon. N. A. Dipt., iv, 236.
brumalis Fitch. Rept. N. Y. State Ent., ii, 243.

Epiphragma Osten Sacken.

fascipennis Say. *Limnobia.* Compl. Writ., ii, 45. (H.L.J.)

Limnophila Macquart.

adusta Osten Sacken. Mon. N. A. Dipt., iv, 215. (C.W.J.)
contempta Osten Sacken. *Ibid.*, iv, 218.
fuscovaria Osten Sacken. *Ibid.*, iv, 225. (C.W.J.)
lenta Osten Sacken. *Ibid.*, iv, 231.
macrocera Say. *Limnobia.* Compl. Writ., ii, 46.
marchandi Alexander. Jour. N. Y. Ent. Soc., xxiv, 118.
montana Osten Sacken. Mon. N. A. Dipt., iv, 227. (H.L.J.)
recondita Osten Sacken. Mon. N. A. Dipt., iv, 212.
rufibasis Osten Sacken. *Ibid.*, iv, 225. (C.W.J.)
ultima Osten Sacken. *Ibid.*, iv, 222. (H.L.J.)

Pseudolimnophila Alexander.

luteipennis Osten Sacken. *Limnophila.* Mon. N. A. Dipt., iv, 217.
noveboracensis Alexander. *Limnophila.* Psyche, xviii, 196.

Eulimnophila Alexander.

tenuipes Say. Compl. Writ., ii, 46.

Hexatoma Latreille.

Anisomera Meigen.

megacera Osten Sacken. *Anisomera.* Mon. N. A. Dipt., iv, 243.

Eriocera Macquart.

longicornis Walker. Mon. N. A. Dipt., iv, 253. (C.W.J.)

Penthoptera Schiner.

albitarsis Osten Sacken. Mon. N. A. Dipt., iv, 257. (Ald. Cat.)

Tricyphona Zetterstedt.

inconstans Osten Sacken. *Amalopis*. Mon. N. A. Dipt., iv, 266. (C.W.J.)

Pedicia Latreille.

albivitta Walker. Insect Book, pl. xvi, 12.

Liogma Osten Sacken.

nodicornis Osten Sacken. Mon. N. A. Dipt., iv, 301. (C.W.J.)

Bittacomorpha Westwood.

clavipes Fabricius. Insect Book, pl. xv, 8.

Ptychoptera Meigen.

rufocincta Osten Sacken. Mon. N. A. Dipt., iv, 313.

Oropeza Needham.

dorsalis Johnson. Proc. Bost. Soc. Nat. Hist., xxxiv, 119.
sayi Johnson. *annulata*. *Ibid.*, xxxiv, 118. (C.W.J.)
subalbipes Johnson. *Ibid.*, xxxiv, 121.

Tanyptera Latreille.

Xiphura Brullé

frontalis Osten Sacken. Proc. Phila. Ent. Soc., iii, 48.
fumipennis Osten Sacken. *Ibid.*, iii, 47.
topazina Osten Sacken. *Ibid.*, iii, 47.

Ctenophora Meigen.

apicata Osten Sacken. Proc. Phila. Ent. Soc., iii, 46.
nubecula Osten Sacken. *Ibid.*, iii, 45. (C.W.J.)

Nephrotoma Meigen.

Pachyrhina Macquart.

eucera Loew. Cent., iv, 39.
ferruginea Fabricius. Insect Book, pl. xv, 17.
incurva Loew. Cent., iv. 32.
lugens Loew. *Ibid.*, v. 26.
macrocera Say. Compl. Writ., ii, 350.
sodalis Loew. Cent., v, 29.
tenuis Loew. *Ibid.*, iv, 41.
virescens Loew. *Ibid.*, v, 25.
xanthostigma Loew. *Ibid.*, v, 31.

Tipula Linnæus.

abdominalis Say. Insect Book, pl. xvi, 4.
angustipennis Loew. Cent iv, 19. (H.L.J.)
annulicornis Say. Compl. Writ., ii, 350.
bella Loew. *Ibid.*, iv, 29.
caloptera Loew. *Ibid.*, iv, 30. (C.W.J.)
cunctans Say. *Ibid.*, ii, 48.
dejecta Walker. Dipt. Saund., 442. (C.W.J.)
eluta Loew. Cent., iv, 27.
fuliginosa Say. *speciosa* Loew. Compl. Writ., ii, 44.
hebes Loew. Cent., iv, 18. (Ald. Cat.)
hermannia Alexander. *fasciata* Loew. Cent., iv, 6; N. Y. (Cornell) Agr. Expt. Sta., Memoir 25, 946. (C.W.J.)
latipennis Loew. Cent., v, 20. (C.W.J.)
longiventris Loew. *Ibid.*, iv, 5. (C.W.J.)
oropezoides Johnson. Proc. Bost. Soc. Nat. Hist., xxxiv, 131.
pallida Loew. *Ibid.*, iv, 16. (C.W.J.)
sayi Alexander. *costalis* Say. Jour. Acad. Nat. Sci., iii, 23.
serta Loew. Cent., iv, 14.
strepens Loew. *Ibid.*, iv, 28. (C.W.J.)
submaculata Loew. *Ibid.*, iv, 23.
tephrocephala Loew. *Ibid.*, v, 23. (C.W.J.)
tricolor Fabricius. Dipt. Exot., i, 22.
trivittata Say. Compl. Writ., ii, 50.
ultima Alexander. *flavicans* Fabricius. Dipt. Exot. (Suppl.), i, 25; N. Y. (Cornell) Agr. Expt. Sta., Memoir 25, 944.
umbrosa Loew. *inermis.* Cent., iv, 31.
valida Loew. Cent., iv, 21. (C.W.J)

Family DIXIDÆ

Dixa Meigen.

clavulus Williston. *modesta.* N. Y. State Mus. Bull., 68, 429. (C.W.J.)
fusca Loew. *Ibid.*, 68, 432. (C.W.J.)
notata Loew. *Ibid.*, 68, 432.

Family PSYCHODIDÆ.

Psychoda Latreille.

alternata Say. Can. Ent., xxvi, 330.
cinerea Banks. *Ibid.*, xxvi, 331.
marginalis Banks. *Ibid.*, xxvi, 333.
minuta Banks. *Ibid.*, xxvi, 331.

Family CHIRONOMIDÆ.

Ceratopogon Meigen.

fusculus Coquillett. Proc. U. S. Nat. Mus., xxiii, 605.
piceus Winnertz. Linn. Ent., vi, 21.

Palpomyia Meigen.

rufus Loew. Cent., i, 12. (C.W.J.)
tibialis Meigen. Fauna Aust., ii, 586.
trivialis Loew. Cent., i, 4. (C.W.J.)

Chironomus Meigen.

cristatus Fabricius. N. Y. State Mus. Bull., 86, 242.
dispar Meigen. *Ibid.*, 86, 213. (C.W.J.)
dorsalis Meigen. Syst. Beschr., i, 25.
dux Johanssen. N. Y. State Mus. Bull. 86, 231. (C.W.J.)
festivus Say. Compl. Writ., ii, 41. (C.W.J.)
modestus Say. *Ibid.*, ii, 41: N. Y. State Mus. Bull., 86, 227.
nigricans Johanssen. N. Y. State Mus. Bull., 86, 219.
pulchripennis Coquillett. *Ibid.*, 86, 204. (C.W.J.)
tæniapennis Coquillett. *Ibid.*, 86, 203.

Orthocladius Van der Wulp.

sp.

Camptocladius Van der Wulp.

byssinus Schrank. Fauna Aust., ii, 612.

Cricotopus Van der Wulp.

sylvestris Fabricius. Fauna Aust., ii, 611.

Eurycnemus Van der Wulp.

scitulus Coquillett. Proc. U. S. Nat. Mus., xxiii, 608. (C.W.J.)

Tanypus Meigen.

carnea Fabricius. Syst. Antl., 41, 1805. (H.L.J.)
dyari Coquillett. Ent. News, xiii, 85.
johnsoni Coquillett. Proc. U. S. Nat. Mus., xxiii, 609.
monilis Linnæus. *annulatus*. Compl. Writ., ii, 43.

Psilotanypus Kieffer.

thoracicus Loew. *Tanypus*. Cent., vii, 3.

Chasmatonotus Loew.

bimaculatus Osten Sacken. West. Dipt., 191.

Family CULICIDÆ.

Wyeomyia Theobald.

smithii Coquillett. *Aëdes smithii*. Mosq. N. A., iii, 94.

Culex Linnæus.

dyari Coquillett. *brittoni*. Mosq. N. A., iii, 457.
pipiens Linnæus. House or rain barrel mosquito. Rept. Conn. Agr. Sta., 1904, 266: Mosq. N. A., iii, 360.
salinarius Coquillett. Mosq. N. A., iii, 373.
territans Walker. *Ibid.*, iii, 293.

Mansonia Blanchard.

perturbans Walker. *Culex*. *Tæniorhynchus*. Mosq. N. A., iii, 505.

Aëdes Meigen.

atropalpus Coquillett. Mosq. N. A., iv, 638.
aurifer Coquillett. *Ibid.*, iv, 766.
canadensis Theobold. *Ibid.*, iv, 647.
cantator Coquillett. Brown salt marsh mosquito. *Ibid.*, iv, 700.
fitchii Felt and Young, or **abfitchii** Felt., *Ibid.*, iv, 682, 688.*
fuscus Osten Sacken. *Ibid.*, iv, 729.
hirsuteron Theobald. *pretans*. *Ibid.*, iv, 743.
onondagensis Felt. *currei*. *Ibid.*, iv, 629.

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* Several females formerly identified as *Culex cantans* have been taken in Connecticut. As it is said to be impossible to separate *fitchii* and *abfitchii* from captured females, the species cannot be definitely placed here.

sollicitans Walker. Banded salt marsh mosquito. *Ibid.*, 658. Rept. Conn. Agr. Expt. Sta., 1904, 268.
sylvestris Theobald. Mosq. N. A., iv, 694.
tæniorhynchus Wiedeman. *Ibid.*, iv, 667.
triseriatus Say. *Ibid.*, iv, 762.
trivittatus Coquillett. *Ibid.*, iv, 773.

Psorophora Robineau-Desvoidy.

ciliata Fabricius. Gallinipper. Rept. Conn. Agr. Expt. Sta., 1904, 271: Mosq. N. A., iv, 530.

Anopheles Meigen.

punctipennis Say. Rept. Conn. Agr. Expt. Sta., 1904, 271: Mosq. N. A., iv, 1009.
quadrimaculatus Say. *maculipennis.* Malarial mosquito. Rept. Conn. Agr. Expt. Sta., 1904, 271: Mosq. N. A., 1028.

Corethra Meigen.

cinctipes Coquillett. Can. Ent., xxxv, 190.

Sayomyia Coquillett.

americana Johanssen. *Corethra plumicornis* var. *americana.* N. Y. State Mus. Bull., 68, 395.

Family MYCETOPHILIDÆ.

Mycomya Rondani.
Sciophila Meigen.

littoralis Say. Compl. Writ., i, 245.

Neoempheria Osten Sacken.

balioptera Leow. Cent., ix, 13.

Leia Meigen.

bivittata Say. *Neoglaphyroptera.* Compl. Writ., ii, 351.
opima Loew. Cent., ix, 29.

Rhymosia Winnertz.

filipes Loew. Cent., ix, 36.

Exechia Winnertz.

absoluta Johanssen. Me. Agr. Expt. Sta. Bull., 200, 72.

Mycetophila Meigen.

contigua Walker. List., i, 46.
discoidea Say. Compl. Writ., ii, 351.
obscura Walker. List, i, 101.
scalaris Loew. *Dynatosoma.* Cent., ix, 48.

Mycetobia Meigen.

divergens Walker. Dipt. Saund., 418.

Macrocera Meigen.

clara Loew. Cent., ix, 6. (C.W.J.)
formosa Loew. *Ibid.*, ix, 8. (C.W.J.)
hirsuta Loew. *Ibid.*, ix, 5. (C.W.J.)
inconcinna Loew. *Ibid.*, ix, 7. (C.W.J.)

Family SCIARIDÆ.

Sciara Meigen.

actuosa Johannsen. Me. Agr. Expt. Sta., Bull. 200, 134.
inconstans Fitch. *Ibid.*, Bull. 200, 139.
jucunda Johannsen. *Ibid.*, Bull. 200, 131.
mellea Johannsen. *Ibid.*, Bull. 200, 129.
ochrolabis Loew. *Ibid.*, Bull. 200, 125.
pauciseta Felt. *Ibid.*, Bull. 200, 130.
prolifica Felt. *Ibid.*, Bull. 200, 128.
sciophila Loew. *Ibid.*, Bull. 200, 126.

Family CECIDOMYIDÆ (ITONIDIDÆ).*

Monardia Kieffer.

modesta Felt. Psyche, xx, 142.

Miastor Meinert.

americanus Felt. Rept. N. Y. State Ent., No. 26, 82.

Rhabdophaga Westwood.

salicifoliæ Felt. Rept. N. Y. State Ent., No. 29, 106.
strobiloides Walsh. *Cecidomyia.* Pine cone willow gall. Proc. Phila. Ent. Soc., iii, 580; Rept. N. Y. State Ent., No. 29, 112.

* For additional species in this family see appendix.

Dasyneura Rondani.

communis Felt. Jour. Econ. Ent., iv, 478; Rept. N. Y. State Ent., No. 29, 181.

gleditschiæ Osten Sacken. Rept. Conn. Agr. Expt. Sta., 1904, 212; Rept. N. Y. State Ent., No. 29, 163.

serrulatæ Osten Sacken. Rept. N. Y. State Ent., No. 29, 186.

Cystiphora Kieffer.

viburnifolia Felt. Jour. Econ. Ent., iv, 480; Rept. N. Y. State Ent. No. 29, 201.

Phytophaga Rondani.

destructor Say. *Cecidomyia. Mayetiola.* Hessian fly. Bur. Ent., Circ. 70.

rigidæ Osten Sacken. *Cecidomyia.* Willow club gall. Rept. N. Y. State Ent., No. 23, 371.

Rhopalomyia Rubsaamen.

anthophili Osten Sacken. Ins. Galls Springfld., 50; Rept. N. Y. State Ent., No. 25, 364, 365. (G. D.)

asterifloræ Felt. Rept. N. Y. State Ent., No. 23, 366.

capitata Felt. *Ibid.*, No. 23, 364.

hirtipes Osten Sacken. Ins. Galls. Springfld., 52. (G.D.)

lateriflori Felt. Rept. N. Y. State Ent. No. 23, 364, 365.

pedicellata Felt. *Ibid.*, 30, 262.

Sackenomyia Felt.

viburnifolia Felt. Rept. N. Y. State Ent., No. 30, 280.

Cincticornia Felt.

connecta Felt. Rept. N. Y. State Ent., No. 23, 381.

globosa Felt. Jour. Econ. Ent., ii, 291.

majalis Osten Sacken. Ins. Galls. Springfld., 17. (G.D.)

pustulata Felt. Jour. Econ. Ent., ii, 291.

Asphondylia Loew.

conspicua Osten Sacken. Ins. Galls Springfld., 54.

monacha Osten Sacken. Rept. N. Y. State Ent., No. 23, 376.

Neolasioptera Felt.

perfoliata Felt. Ins. Galls, Springfld., 49. (G.D.)

ramuscula Beutenmüller. Rept. N. Y. State Ent., No. 23, 333.

sambuci Felt. Ins. Galls, Springfld., 48. (G.D.)

Lasioptera Meigen.

corni Felt. Rept. N. Y. State Ent., No. 23, 324.
impatientifolia Felt. Ins. Galls Springfld., 43; Rept. N. Y. State Ent., No. 23, 324. (G.D.)
querciperda Felt. Rept. N. Y. State Ent., No. 23, 324.
vitis Osten Sacken. *Ibid.*, No. 4, 183; No. 23, 324.

Asteromyia Felt.

carbonifera Felt. *Baldratia.* Rept. N. Y. State Ent., No. 23, 328.
divaricata Felt. *Baldratia.* *Ibid.*, No. 23, 330.
læviana Felt. *Baldratia.* *Ibid.*, No. 23, 330.
nigrina Felt. Jour. Econ. Ent., iv, 481.
reducta Felt. *Ibid.*, iv, 481.
rosea Felt. *Baldratia.* Rept. N. Y. State Ent., No. 23, 328.
rubra Felt. *Baldratia.* *Ibid.*, No. 23, 329.
sylvestris Felt. Can. Ent., xlvii, 228.
vesiculosa Felt. Jour. Econ. Ent., ii, 286.

Camptoneuromyia Felt.

rubifolia Felt. Rept. N. Y. State Ent., No. 23, 334.

Contarinia Rondani.

canadensis Felt. State Mus. Bull., 200, 178.
pyrivora Riley. Pear midge. Rept. Conn. Agr. Expt. Sta., 1913, 239.
tritici Kirby. Wheat midge. Jour. Econ. Ent., 5, 289.
violicola Coquillett. Violet Midge. Bur. Ent., N. S., Bull. 27, 47.
virginiana Felt. Ins. Galls Springfld., 40. (G.D.)

Thecodiplosis Kieffer.

liriodendri Osten Sacken. *Cecidomyia.* Mon. N. A. Dipt., i, 202.

Youngomyia Felt.

umbellicola Osten Sacken. Trans. Am. Ent. Soc., iii, 52.

Clinodiplosis Kieffer.

florida Felt. Rept. N. Y. State Ent., No. 23, 411.

Caryomyia Felt.

caryæ Osten Sacken. *Hormomyia.* Rept. N. Y. State Ent., No. 23, 388.
consobrina Felt. *Hormomyia.* *Ibid.*, No. 23, 387.
persicoides Beutenmüller. *Cecidomyia.* Mon. N. A. Dipt., i, 193.

sanguinolenta Osten Sacken. *Cecidomyia. Ibid.*, i, 192.
thompsoni Felt. *Hormomyia.* Rept. N. Y. State Ent., No. 23, 388.

Hormomyia Loew.

modesta Felt. Psyche, xx, 145.

Itonida Meigen.

foliora Russell and Hooker. *Cecidomyia erubescens.* Ent. News, xix, 349.

Retinodiplosis Kieffer.

resinicola Osten Sacken. Trans. Am. Ent. Soc., iii, 345.

Cecidomyia Meigen.

deserta Patton. Can. Ent., xxix, 247. (Ald. Cat.)
eupatoriflorae Beutenmüller. Ins. Galls Springfld., 49 (G.D.)
impatientis Osten Sacken. *Ibid.*, 43. (G.D.)
ocellaris Osten Sacken. *Sciara.* Ocellate leaf gall. Rept. U. S. Dept. Agr., 1881-2, 202.
pudibunda Osten Sacken. Ins. Galls Springfld., 15. (G.D.)
squamulicola Stebbins. *Ibid.*, 16.
verrucicola Osten Sacken. Can. Ent., vii, 201.

Family BIBIONIDÆ.

Bibio Geoffroy.

albipennis Say. Insect Book, pl. xv, 18.
femoratus Weidemann. Dipt. Exot. (Suppl.), i, 87.
longipes Loew. Cent., v, 12.
pallipes Say. Compl. Writ., ii, 68.
xanthopus Wiedemann. Dipt. Exot. (Suppl.), i, 88.

Dilophus Meigen.

dimidiatus Loew. Cent., viii, 3. (C.W.J.)

Family SCATOPSIDÆ.*

Rhegmoclema Enderlein.

atrata Say. *Scatopse.* Wash. Agr. Expt. Sta., Bull. 130, 12.

Reichertella Enderlein.

femoralis Macquart. *Scatopse pulicaria* Loew. Wash. Agr. Expt. Sta., Bull. 130, 9.

* See also appendix.

Family SIMULIIDÆ.

Simulium Latreille.

bracteatum Coquillett. Bur. Ent. Bull., 10, New ser., 69.
pecuarum Riley. *invenustum*. Bur. Ent., Bull. 10, New ser., 68.

Family RYPHIDÆ.

Ryphus Latreille.

alternatus Say. Compl. Writ., ii, 51.
fenestralis Scopoli. Fauna Aust., ii, 495.
punctatus Fabricius. *marginatus*. Compl. Writ., ii, 50.

Family STRATIOMYIDÆ.

Allognosta Osten Sacken.

fuscitarsis Say. *Beris*. Compl. Writ., ii, 52.
obscuriventris Loew. Cent., iv, 45.

Ptecticus Loew.

sackenii Williston. Can. Ent., xvii, 124. (C.W.J.)
trivittatus Say. *Sargus*. Compl. Writ., ii, 355.

Macrosargus Bigot.

Sargus Fabricius.

cuprarius Linnæus. Fauna Aust., i, 21; Psyche, xxii, 29.
decorus Say. Insect Book, pl. xvi, 11.
elegans Loew. Cent., vii, 10.
viridis Say. Compl. Writ., ii, 77.

Stratiomyia Geoffroy.

badius Walker. Trans. Am. Ent. Soc., xxii, 243. (A.B.C.)
discalis Loew. *Ibid.*, xxii, 240.
meigenii Wiedemann. *Ibid.*, xxii, 238.
normula Loew. *Ibid.*, xii, 255. (Ald. Cat.)
quaternaria Loew. *Ibid.*, xxii, 241. (Ald. Cat.)

Odontomyia Meigen.

cincta Olivier. Trans. Am. Ent. Soc., xxii, 253.
flavicornis Olivier. *Ibid.*, xxii, 269.
hydroleonoides Johnson. *Ibid.*, xxii, 261. (C.W.J.)
interrupta Olivier. *Ibid.*, xxii, 265.

microstoma Loew. *Ibid.*, xxii, 264.
pubescens Day. *Ibid.*, xxii, 264.
virgo Wiedemann. *Ibid.*, xxii, 262.

Euparyphus Gerstaecker.

bellus Loew. Cent., vii, 18. (C.W.J.)

Nemotelus Geoffroy.

carbonarius Loew. Psyche, x, 177.
unicolor Loew. *Ibid.*, x, 176. (C.W.J.)

Oxycera Meigen.

maculata Olivier. Encycl. Meth., viii, 600. (C.W.J.)

Family TABANIDÆ.

Pangonia Latreille.

rasa Loew. Tab. Ohio, 45.

Chrysops Meigen.

callidus Osten Sacken. Tab. Ohio, 35.
carbonarius Walker. Ohio Nat., v, 219.
celer Osten Sacken. Tab. Ohio, 36.
cuclux Whitney. Can. Ent., xi, 35.
cursim Whitney. *Ibid.*, xi, 36.
delicatulus Osten Sacken. Prodrome, i, 380.
dimmocki Hine. Ohio Nat., vi, 393.
fallax Osten Sacken. Tab. Ohio, 36.
flavidus Wiedemann. *Ibid.*, 37.
frigidus Osten Sacken. Prodrome, i, 384.
hilaris Osten Sacken. Insect Book, pl. xvi, 17.
indus Osten Sacken. Tab. Ohio, 33, 34.
lugens Wiedemann var. **morosus** Osten Sacken. Prodrome, i, 377. (J.S.H.)
mœchus Osten Sacken. Tab. Ohio, 39.
montanus Osten Sacken. *Ibid.*, 40.
niger Macquart. Insect Book, pl. xv, 36.
obsoletus Wiedemann. Tab. Ohio, 42.
plangens Wiedemann. *fuliginosus*. Dipt. Exot. Suppl., i, 19.
pudicus Osten Sacken. Prodrome, i, 381.
sackeni Hine. Tab. Ohio, 42.
univittatus Macquart. *Ibid.*, 44.
vittatus Wiedemann. Insect Book, pl. xv, 37.

Tabanus Linnæus.

abdominalis Fabricius. Prodrome, ii, 434.
acteon Osten Sacken. *Ibid.*, ii, 443. (Ald. Cat.)
astutus Osten Sacken. *Ibid.*, ii, 471. (Ald. Cat.)
atratus Fabricius. Black horse fly. Insect Book, pl. xv, 42.
bicolor Wiedemann. *Ibid.*, pl. xvi, 13.
cinctus Fabricius. Prodrome, ii 464.
coffeatus Macquart. *Ibid.*, ii, 441. (A.B.C.)
costalis Wiedemann. Insect Book, pl. xv, 38.
epistates Osten Sacken. Tab. Ohio, 50. (A.B.C.)
giganteus DeGeer. Prodrome, ii, 464. (C.W.J.)
hinei Johnson. Psyche, xl, 15.
lasiophthalmus Macquart. Insect Book, pl. xv, 41.
lineola Fabricius. *Ibid.*, pl. xv, 35.
longus Osten Sacken. Tab. Ohio, 52.
microcephalus Osten Sacken. Prodrome, ii, 470.
nigrescens Beauvois. *Ibid.*, ii, 453.
nigrovittatus Macquart. *Ibid.*, ii, 449.
nivosus Osten Sacken. Tab. Ohio, 52.
ohioensis Hine. *Ibid.*, 53.
orion Osten Sacken. Prodrome, ii, 442.
pumilis Macquart. Tab. Ohio, 53. (A.B.C.)
recedens Walker. *catenatus*. Prodrome, ii, 433.
sparus Whitney. Can. Ent., xi, 38. (Ald. Cat.)
stygius Say. Tab. Ohio, 54. (Ald. Cat.)
superjumentarius Whitney. Can. Ent., xi, 37.
trimaculatus Beauvois. Tab. Ohio, 55. (A.B.C.)
trispilus Wiedemann. Insect Book, pl. xvi, 5.
vivax Osten Sacken. Tab. Ohio, 56.

Merycomyia Hine.

whitneyi Johnson. *geminata* Hine. Psyche, xi, 15; Ohio Nat., xii, 515.

Family LEPTIDÆ.

Cœnomyia Latreille.

ferruginea Scopoli. *cinercibarbis* Bigot. Can. Ent., xvii, 122.

Xylophagus Meigen.

lugens Loew. Cent., iii, 8.
persequus Walker. Dipt. Saund., i. (A.B.C.)

Solva Walker.

Xylomyia Rondani.

pallipes Loew. Cent. iii, 122. (W.E.B.)

Dialysis Walker.

elongata Say. Compl. Writ., ii, 58. (C.W.J.)

Rhagio Fabricius.

Leptis Fabricius.

mystacea Macquart. Insect Book, pl. xvi, 15.
punctipennis Say. Compl. Writ., ii, 55.
scapularis Loew. Cent., i, 22. (S.W.W.)
vertebrata Say. Compl. Writ., i, 27.

Chrysophila Macquart.

basilaris Say. Trans. Am. Ent. Soc., v, 285.
fasciata Say. Compl. Writ., i, 28.
ornata Say. Insect Book, pl. xv, 2.
propinqua Walker. List, i, 215.
proxima Walker. *Ibid.*, i, 214.
quadrata Say. *Leptis*. Compl. Writ., ii, 55. (W.E.B.)
thoracica Fabricius. Insect Book, pl. xvi, 18.

Atherix Meigen.

variegata Walker. List, i, 218. (H.L.J.)

Symphoromyia Frauenfield.

hirta Johnson. Ent. News, viii, 120.

Glutops Burgess.

singularis Burgess. Proc. Bost. Soc. Nat. Hist., 1878, 320. (H.L.J.)

Family CYRTIDÆ.

Oncodes Latreille.

costatus Loew. Cent., ix, 67. (C.W.J.)
pallidipennis Loew. *Ibid.*, vi, 32.

Acrocera Meigen.

nigrina Westwood. Trans. Ent. Soc., Lond., v, 98. (C.W.J.)

Family BOMBYLIIDÆ.

Spogostylum Macquart.

anale Say. Compl. Writ., ii, 60.
œdipus Fabricius. *Anthrax irrorata. Ibid.*, ii, 61. (S.W.W.)
simson Fabricius. Insect Book, pl. xvii, 11.

Exoprosopa Macquart.

fasciata Macquart. Insect Book, pl. xviii, 18.
fascipennis Say. *Ibid.*, pl. xvii, 5.

Villa Lioy.

Anthrax Scopoli.

alternata Say. Trans. Am. Ent. Soc., xiv, 166.
fulvohirta Wiedemann. *Ibid.*, xiv, 174.
lateralis Say. *Ibid.*, xiv, 166; xix, 169.
lepidota Osten Sacken. Trans. Am. Ent. Soc., xix, 176. (C.W.J.)
morio Linnæus. Trans. Am. Ent. Soc., xxi, 98. (C.W.J.)
sinuosa Wiedemann. Insect Book, pl. xvii, 7.
webberi Johnson. Psyche, xxvi, 11.

Bombylius Linnæus.

fraudulentus Johnson. Psyche, xiv, 99.
fulvibasis Macquart. *atriceps* Loew. Cent. iv, 49.
major Linnæus. Insect Book, pl. xvii, 6.
pulchellus Loew. Cent., iv, 47. (S.W.W.)
pygmæus Fabricius. Insect Book, pl. xviii, 19.
varius Fabricius. *Ibid.*, pl. xviii, 22. (A.B.C.)

Sparnopolius Loew.

fulvus Wiedemann. Insect Book, pl. xviii, 26.

Systropus Wiedemann.

macer Loew. Cent., iv, 56.

Geron Meigen.

senilis Fabricius. Cent., ix, 1908.

Family THEREVIDÆ.

Tabuda Walker.

fulvipes Walker. Proc. Phila. Ent. Soc., i, 217.

Psilocephala Zetterstedt.

aldrichi Coquillet. Can. Ent., xxv, 227.
hæmorrhoidalis Macquart. Insect Book, pl. xviii, 27.
melanoprocta Loew. Cent., viii, 15. (H.L.J.)
pictipennis Wiedemann. Dipt. Exot. Suppl., 113. (H.L.J.)

Thereva Latreille.

albiceps Loew. Cent., ix, 69. (C.W.J.)
candidata Loew. Can. Ent., xxv, 197.
frontalis Say. Compl. Writ., i, 252. (C.W.J.)

Family SCENOPINIDÆ.

Scenopinus Latreille.

fenestralis Linnæus. *pallipes*. Compl. Writ., ii, 86. (C.W.J.)
glabrifrons Meigen. Fauna Aust., i, 160.

Family MYDAIDÆ.

Mydas Fabricius.

clavatus Drury. *filatus*. Dipt. Exot. Suppl., 116.

Family ASILIDÆ.

Leptogaster Meigen.

badius Loew. Trans. Am. Ent. Soc., xxxv, 160.
flavillaceus Loew. Cent., ii, 12.
flavipes Loew. Trans. Am. Ent. Soc., xxxv, 163.
loewi Banks. Psyche, xxi, 133. (C.W.J.)
testacea Loew. Cent., ii, 10. (C.W.J.)

Ceraturgus Wiedemann.

cruciatus Say. Insect Book, pl. xvi, 29.

Dioctria Meigen.

albius Walker. Insect Book, pl. xvii, 12.
baumhaueri Meigen. Syst. Beschr, ii, 245.
brevis Banks. Psyche, xxiv, 117.

Cyrtopogon Loew.

falto Walker. *chrysopogon* Loew. Insect Book, pl. xix, 28.
marginalis Loew. Trans. Am. Ent. Soc., xxxv, 267.

Lasiopogon Loew.

Daulopogon Loew.

opaculus Loew. Trans. Am. Ent. Soc., xxxv, 299. (C.W.J.)
terricola Johnson. Ent. News, xi, 326.
tetragrammus Loew. Trans. Am. Ent. Soc., xxxv, 301. (C.W.J.)

Holcocephala Jænnicke.

abdominalis Say. Trans. Am. Ent. Soc., xxxv, 309.

Holopogon Loew.

guttula Wiedemann. Trans. Am. Ent. Soc., xxxv, 313.

Stichopogon Loew.

trifasciatus Say. Trans. Am. Ent. Soc., xxxv, 335.

Deromyia Philippi.

discolor Loew. Trans. Am. Ent. Soc., xxxv, 358.
umbrina Loew. *Ibid.*, xxxv, 367.
winthemi Wiedemann. *Ibid.*, xxxv, 371.

Taracticus Loew.

octopunctatus Say. Trans. Am. Ent. Soc., xxxv, 373.

Atomosia Macquart.

puella Wiedemann. Psyche, x, 114.

Lampria Macquart.

bicolor Wiedemann. Insect Book, pl. xvi, 27.

Dasyllis Loew.

champlainii Walton. Ent. News, xxi, 243. (A.B.C.)
flavicollis Say. *Laphria*. Compl. Writ., i, 255.
grossa Fabricius. *Laphria tergissa*. *Ibid.*, ii, 67.
posticata Say. *Laphria*. Compl. Writ., i, 255.
thoracica Fabricius. Insect Book, pl. xviii, 11.

Laphria Meigen.

canis Williston. Trans. Am. Ent. Soc., xi, 31: Insect Book, pl. xvii, 10.
gilva Linnæus. *bilineata*. Trans. Am. Ent. Soc., xi, 30. (D.J.C.)

Ommatius Wiedemann.

marginellus Fabricius. *tibialis*. Insect Book, pl. xvi, 25.

Proctacanthus Macquart.

brevipennis Wiedemann. Trans. Am. Ent. Soc., xii, 73.
philadelphicus Macquart. Insect Book, pl. xvii, 24.

Erax Scopoli.

aestuans Linnæus. *bastardii* Macquart. Insect Book, pl. xvii, 14.
albibarbis Macquart. *cinerascens. furax.* Trans. Am. Ent. Soc., xii, 67.
rufibarbis Macquart. Dipt. Exot. Suppl., 1, 2, 116; Psyche, xvi, 33. (C.W.J.)

Promachus Loew.

bastardii Macquart. Trans. Am. Ent. Soc., xii, 63.
fitchii Osten Sacken. *Ibid.*, xiii, 61. (H.L.J.)

Asilus Linnæus.

auricomus Hine. Ann. Ent. Soc. Am., ii, 148.
erythocnemius Hine. *Ibid.*, ii, 163. (J.S.H.)
flavofemorata Hine. *flavipes. Ibid.*, ii, 153.
notatus Wiedemann. *Ibid.*, ii, 157.
novæ-scotiæ Macquart. *Ibid.*, ii, 157.
orphne Walker. *distinctus. Ibid.*, ii, 154.
paropus Walker. *Ibid.*, ii, 161. (J.S.H.)
sadyates Walker. *Ibid.*, ii, 156.
sericeus Say. Insect Book, pl. xvii, 20.
snowii Hine. *annulatus.* Ann. Ent. Soc. Am., ii, 160.

Family DOLICHOPODIDÆ.

Psilopus Meigen.

caudatus Wiedemann. *caudatulus.* Mon. N. A. Dipt., ii, 271.
filipes Loew. *Ibid.*, ii, 286. (S.W.W.)
pallens Wiedemann. *Ibid.*, ii, 275. (C.W.J.)
patibulatus Say. Compl. Writ., ii, 76.
scaber Loew. Mon. N. A. Dipt., ii, 250. (C.W.J.)
scobinator Loew. *Ibid.*, ii, 268. (C.W.J.)
sipho Say. Compl. Writ., ii, 75.
tener Loew. Cent., ii, 71.
unifasciatum Say. Compl. Writ., ii, 75. (C.W.J.)

Diaphorus Meigen.

leucostoma Loew. Mon. N. A. Dipt., ii, 166. (C.W.J.)
mundus Loew. *Ibid.*, ii, 161. (C.W.J.)
sodalis Loew. *Ibid.*, ii, 163. (C.W.J.)
spectabilis Loew. *Ibid.*, ii, 162. (C.W.J.)

Asyndetus Loew.

johnsoni Van Duzee. Psyche, xxiii, 93. (C.W.J.)

Chrysotus Meigen.

affinis Loew. Mon. N. A. Dipt., ii, 178. (C.W.J.)
auratus Loew. *Ibid.*, ii, 183.
discolor Loew. *Ibid.*, ii, 182.
obliquus Loew. *Ibid.*, ii, 176.

Argyra Macquart.

albicans Loew. Mon. N. A. Dipt., ii, 125. (C.W.J.)
aldrichi Johnson. Psyche, x, 18.
calcitrans Loew. Mon. N. A. Dipt., ii, 130.

Leucostola Macquart.

cingulata Loew. Mon. N. A. Dipt., ii, 152. (C.W.J.)

Porphyrops Meigen.

longipes Loew. Mon. N. A. Dipt., ii, 140. (C.W.J.)
melampus Loew. *Ibid.*, ii, 141. (C.W.J.)
nigricoxa Loew. *Ibid.*, ii, 145. (C.W.J.)

Syntormon Loew.

cinereiventris Loew. Mon. N. A. Dipt., ii, 137. (S.W.W.)

Sympycnus Loew.

lineatus Loew. Mon. N. A. Dipt., ii, 189.

Neurigona Rondani.

carbonifer Loew. Cent., x, 84. (C.W.J.)
rubella Loew. Mon. N. A. Dipt., ii, 227. (C.W.J.)
tarsalis Van Duzee. Ann. Ent. Soc. Am., vi, 51.

Hydrophorus Fallen.

intentus Aldrich. Psyche, xviii, 51.
parvus Loew. Mon. N. A. Dipt., ii, 216. (C.W.J.)
pirata Loew. *Ibid.*, ii, 214.

Rhaplium Meigen.

lugubre Loew. *Pelastoneura.* Mon. N. A. Dipt., ii, 105. (C.W.J.)

Dolichopus Latreille.

albicoxa Aldrich. Kans. Univ. Quart., ii, 10. (Ald. Cat.)
brevimanus Loew. Mon. N. A. Dipt., ii, 39. (C.W.J.)
calcaratus Aldrich. Kans. Univ. Quart., ii, 8. (C.W.J.)
comatus Loew. Mon. N. A. Dipt., ii, 69.
cuprinus Wiedemann. *Ibid.,* ii, 55.
detersus Loew. Kans. Univ. Quart., ii, 8. (C.W.J.)
eudactylus Loew. Mon. N. A. Dipt., ii, 48. (C.W.J.)
incisuralis Loew. *Ibid.,* ii, 74. (C.W.J.)
laticornis Loew. *Ibid.,* ii, 29. (Ald. Cat.)
latipes Loew. *Ibid.,* ii, 17. (Ald. Cat.)
longipennis Loew. *Ibid.,* ii, 57. (C.W.J.)
marginatus Aldrich. Kans. Univ. Quart., ii, 17.
melanocerus Loew. Mon. N. A. Dipt., ii, 330.
palæstricus Loew. *Ibid.,* ii, 328. (C.W.J.)
præustus Loew. *Ibid.,* ii, 68. (C.W.J.)
quadrilamellatus Loew. *Ibid.,* ii, 331. (C.W.J.)
ramifer Loew. *Ibid.,* ii, 52. (C.W.J.)
setifer Loew. *Ibid.,* ii, 30. (C.W.J.)
variabilis Loew. *Ibid.,* ii, 50.
vittatus Loew. *Ibid.,* ii, 55.

Gymnopternus Loew.

barbatulus Loew. Mon. N. A. Dipt., ii, 82. (S.W.W.)
crassicauda Loew. *Ibid.,* ii, 95.
flavus Loew. *Ibid.,* ii, 80.
lævigatus Loew. *Ibid.,* ii, 87.
opacus Loew. *Ibid.,* ii, 93.
ventralis Loew. *Ibid.,* ii, 97.
sp.

Pelastoneurus Loew.

lætus Loew. Mon. N. A. Dipt., ii, 106.
lamellatus Loew. *Ibid.,* ii, 338.
vagans Loew. *Ibid.,* ii, 107. (C.W.J.)

Family EMPIDIDÆ.

Drapetis Meigen.

gilvipes Loew. Trans. Am. Ent. Soc., xxviii, 212. (C.W.J.)
spectabilis Melander. *Ibid.*, xxviii, 212.

Platypalpus Macquart.

æqualis Loew. Trans. Am. Ent. Soc., xxviii, 222.

Tachydromia Meigen.

pusilla Loew. Trans. Am. Ent. Soc., xxviii, 229.

Hemerodromia Meigen.

defecta Loew. Trans. Am. Ent. Soc., xxviii, 235. (C. W. J.)
empiformis Say. *Ibid.*, xxviii, 236.

Litanomyia Melander.

elongata Melander. Trans. Am. Ent. Soc., xxviii, 232.

Clinocera Meigen.

lineata Loew. Cent., ii, 250. (C.W.J.)
sp.

Syneches Walker.

rufus Loew. Trans. Am. Ent. Soc., xxviii, 253.
simplex Walker. *Ibid.*, xxviii, 254.

Syndyas Loew.

polita Loew. Trans. Am. Ent. Soc., xxviii, 254.

Hybos Meigen.

electus Melander. Trans. Am. Ent. Soc., xxviii, 247 (C.W.J.)
slossonæ Coquillett. *Ibid.*, xxviii, 247.
triplex Walker. *Ibid.*, xxviii, 248.

Leptopeza Macquart.

compta Coquillett. Trans. Am. Ent. Soc., xxviii, 258 (C.W.J.)

Empis Linnæus.

distans Loew. Trans. Am. Ent. Soc., xxviii, 295.
otiosa Coquillett. *Ibid.*, xxviii, 302. (A.B.C.)
pœciloptera Loew. *Ibid.*, xxviii, 298. (C.W.J.)
sordida Loew. Cent., i, 29. (H.L.J.)
spectabilis Loew. Trans. Am. Ent. Soc., xxviii, 311.
tridentata Coquillett. *Ibid.*, xxviii, 301.

Hilara Meigen.

leucoptera Loew. Trans. Am. Ent. Soc., xxviii, 266.
mutabilis Loew. *Ibid.*, xxviii, 265. (C.W.J.)
trivittata Loew. *Ibid.*, xxviii, 265. (C.W.J.)
umbrosa Loew. *Ibid.*, xxviii, 264.
velutina Loew. *Ibid.*, xxviii, 264. (C.W.J.)

Rhamphomyia Meigen.

angustipennis Loew. Cent., i, 55.
aperta Loew. *Ibid.*, ii, 27. (H.L.J.)
brevis Loew. Proc. U. S. Nat. Mus., xviii, 414.
fumosa Loew. Cent., i, 39.
gilvipes Loew. *Ibid.*, i, 48. (C.W.J.)
irregularis Loew. *Ibid.*, v, 60.
longicauda Loew. Proc. U. S. Nat. Mus., xviii, 411.
manca Coquillett. *Ibid.*, xviii, 415-427.
mutabilis Loew. *Ibid.*, xviii, 411.
nana Loew. *Ibid.*, xviii, 414.
pulla Loew. *Ibid.*, xviii, 411-412. (Ald. Cat.)
pusio Loew. *Ibid.*, xviii, 414.
scolopacea Say. Compl. Writ., ii, 38. (C.W.J.)
umbilicata Loew. Cent., i, 65. (C.W.J.)

Family LONCHOPTERIDÆ.

Lonchoptera Meigen.

lutea Panzer. Faun. Germ., cviii, 20.
riparia Meigen. Syst. Beschr., iv, 108.

Family PHORIDÆ.

Paraspinophora Malloch.

multiseriata Aldrich. Trans. Am. Ent. Soc., xxix, 345 (C.W.J.)

Dohrniphora Dahlbom.

concinna Meigen. *nitidifrons* Brues. Trans. Am. Ent. Soc., xxix, 347.

Chætoneurophora Malloch.

spinipes Coquillett. Can. Ent., xxvii, 105.

Aphiochæta Brues.

approximata Malloch. Proc. U. S. Nat. Mus., 43, 483.
epeiræ Brues. Trans. Am. Ent. Soc., xxix, 358.
nigriceps Loew. Cent., vii, 99. (G.A.C.)
rufipes Meigen. Trans. Am. Ent. Soc., xxix, 368: Rept. Conn. Agr. Expt. Sta., 1909-10, 693.

Phora Latreille.

Trineura Meigen.

aterrima Fabricius. Trans. Am. Ent. Soc., xxix, 378. (C.W.J.)

Conocera Meigen.

atra Meigen. Trans. Am. Ent. Soc., xxix, 380.

Family PIPUNCULIDÆ.

Chalarus Walker.

spurius Fallen. Trans. Am. Ent. Soc., xxxvi, 274.

Pipunculus Latreille.

atlanticus Hough. Trans. Am. Ent. Soc., xxxvi, 294. (C.W.J.)
cingulatus Loew. *Ibid.*, xxxvi, 299.
minor Cresson. *Ibid.*, xxxvi, 293.
nitidiventris Loew. Proc. Bost. Soc. Nat Hist., xxix, 82.
pallipes Johnson. Ent. News, xiv, 107. (C.W.J.)
similis Hough. Trans. Am. Ent. Soc., xxxvi, 315. (C.W.J.)
subvirescens Loew. Proc. Bost. Soc. Nat. Hist., xxix, 84.

Family SYRPHIDÆ.

Microdon Meigen.

cothurnatus Bigot. Syn. N. A. Syrph., 8. (C.W.J.)
fuscipennis Macquart. *Ibid.*, 4. (C.W.J.)
globosus Fabricius. *Ibid.*, 4.
megalogaster Snow. Kans. Univ. Quart., i, 34. (C.W.J.)
ruficrus Williston. Syn. N. A. Syrph. 7. (Ald. Cat.)
tristis Loew. *Ibid.*, 6. (A.B.C.)

Chrysotoxum Meigen.

derivatum Walker. Syn. N. A. Syrph., 16. (C.W.J.)
laterale Loew. *Ibid.*, 14.
pubescens Loew. *Ibid.*, 15. (A.B.C.)

Chrysogaster Loew.

nigripes Loew. Syn. N. A. Syrph., 33.
nitida Wiedemann. *Ibid.*, 35.
pictipennis Loew. *Ibid.*, 37.
pulchella Williston. *Ibid.*, 35.

Pipiza Fallen.

albipilosa Williston. Syn. N. A. Syrph., 28.
calcarata Loew. *Ibid.*, 24. (A.B.C.)
femoralis Loew. *Ibid.*, 26. (C.W.J.)
modesta Loew. *Ibid.*, 24.
pulchella Williston. Syn. N. A. Syrph., 29. (Ald. Cat.)
radicum Walsh and Riley. *pistica*. *Ibid.*, 29. (Ald. Cat.)

Paragus Latreille.

bicolor Fabricius. Syn. N. A. Syrph., 18.
tibialis Fallen. *Ibid.*, 19.

Chilosia Meigen.

cyanescens Loew. Syn. N. A. Syrph., 42. (Ald. Cat.)
pallipes Loew. *Ibid.*, 41.
tristis Loew. *Ibid.*, 293.

Myiolepta Newman.

nigra Loew. Cent. x, 52. (C.W.J.)

Baccha Fabricius.

cognata Loew. Syn. N. A. Syrph., 122.
fascipennis Wiedemann. *aurinota* Harris. *Ibid.*, 120.

Ocyptamus Macquart.

fuscipennis Say. *Baccha*. Syn. N. A. Syrph., 119. (Ald Cat.)

Pyrophæna Schiner.

granditarsus Fœrster. *ocymi*. Syn. N. A. Syrph. 55. (C.W.J.)

Platychirus St. Fargeau and Serville.

hyperboreus Stæger. Syn. N. A. Syrph., 57.
peltatus Meigen. *Ibid.*, 58. (C.W.J.)
quadratus Say. *Ibid.*, 57.

Melanostoma Schiner.

mellinum Linnæus. Syn. N. A. Syrph., 49.
obscurum Say. *Ibid.*, 48.

Didea Macquart.

fasciata Macquart. Syn. N. A. Syrph., 89. (A.B.C.)

Syrphus Fabricius.

amalopis Osten Sacken. Syn. N. A. Syrph., 69. (S.W.W.)
americanus Wiedmann. *Ibid.*, 82.
arcuatus Fallen. *Ibid.*, 68.
grossulariæ Meigen. *lesueurii.* Syn. N. A. Syrph., 80.
latifasciatus Macquart. *abbreviatus* Zetterstedt. *Ibid.*, 81.
perplexus Osburn. Jour. N. Y. Ent. Soc., xviii, 155.
ribesii Linnæus. Syn. N. A. Syrph., 77.
torvus Osten Sacken. *Ibid.*, 79.
xanthostomus Williston. *Ibid.*, 86

Allograpta Osten Sacken.

obliqua Say. Syn. N. A. Syrph., 96.

Xanthogramma Schiner.

æqualis Loew. Syn. N. A. Syrph., 95. (A.B.C.)
emarginata Say. *Ibid.*, 93. (A.B.C.)
felix Osten Sacken. *Ibid.*, 91. (S.W.W.)
flavipes Loew. *Ibid.*, 94.

Mesogramma Loew.

geminata Say. *Mesograpta.* Syn. N. A. Syrph., 102.
marginata Say. *Mesograpta.* *Ibid.*, 100.
polita Say. *Mesograpta.* *Ibid.*, 98.

Sphærophoria St. Fargeau and Serville.

cylindrica Say. Syn. N. A. Syrph., 105.

Sphegina Meigen.

campanulata Robertson. Can. Ent., xxxiii, 284. (C.W.J.)
keeniana Williston. Syn. N. A. Syrph., 113. (C.W.J.)
lobata Loew. *Ibid.*, 115. (C.W.J.)
rufiventris Loew. *Ibid.*, 114. (H.W.W.)

Neoascia Williston.

distincta Williston. Syn. N. A. Syrph., 112. (C.W.J.)
globosa Walker. *Ibid.*, 111.

Rhingia Scopoli.

nasica Say. Syn. N. A. Syrph., 130.

Brachyopa Meigen.

media Williston. Syn. N. A. Syrph., 132.

Volucella Geoffroy.

evecta Walker. Syn. N. A. Syrph., 136. (A.B.C.)
vesiculosa Fabricius. *Ibid.*, 141. (Ald. Cat.)

Sericomyia Meigen.

chrysotoxoides Macquart. Syn. N. A. Syrph., 157.
militaris Walker. *Ibid.*, 155. (A.B.C.)

Eristalis Latreille.

æneus Scopoli. Syn. N. A. Syrph., 161.
arbustorum Linnæus. Jour. N. Y. Ent. Soc., xxiii, 139.
bastardii Macquart. Syn. N. A. Syrph., 168.
brousi Williston. *Ibid.*, 165.
compactus Walker. *Ibid.*, 169. (S.W.W.)
dimidiatus Weidemann. *Ibid.*, 162.
flavipes Walker. *Ibid.*, 168.
saxorum Wiedemann. *Ibid.*, 163.
tenax Linnæus. *Ibid.*, 160.
transversus Wiedemann. *Ibid.*, 170.

Tropidia Meigen.

quadrata Say. Syn. N. A. Syrph., 207.

Helophilus Meigen.

chrysostomus Wiedemann. Syn. N. A. Syrph., 190.
conostoma Williston. *Ibid.*, 193.
distinctus Williston. *Ibid.*, 192.
hamatus Loew. *Ibid.*, 195.
integer Loew. *Ibid.*, 195.
lætus Loew. *Ibid.*, 189. (Ald. Cat.)
latifrons Loew. *Ibid.*, 188. (S.W.W.)
similis Macquart. *Ibid.*, 189.

Mallota Meigen.

cimbiciformis Fallen. Syn. N. A. Syrph., 202.
posticata Fabricius. *Ibid.*, 201. (A.B.C.)

Triodonta Williston.

curvipes Wiedemann. Syn. N. A., Syrph., 206.

Pterallastes Loew.

thoracicus Loew. Cent., iv, 80. (A.B.C.)

Teuchocnemis Osten Sacken.

lituratus Loew. Syn. N. A. Syrph., 200. (S.W.W.)

Syritta St. Fargeau and Serville.

pipiens Linnæus. Syn. N. A. Syrph., 240.

Xylota Meigen.*

angustipennis Loew. Syn. N. A. Syrph., 231.
bicolor Loew. *Ibid.*, 229. (A.B.C.)
chalybea Wiedemann. *Ibid.*, 233.
ejuncida Say. *Ibid.*, 229.
fraudulosa Loew. *Ibid.*, 230. (A.B.C.)
obscura Loew. *Ibid.*, 233. (C.W.J.)

Ferdinandea Rondani.

dives Osten Sacken. *Chrysochlamys.* West. Dipt., 340; Syn. N. A. Syrph., 241. (C.W.J.)

Brachypalpus Macquart.

frontosus Loew. Syn. N. A. Syrph., 221. (A.B.C.)

Criorhina Meigen.

analis Macquart. Syn. N. A. Syrph., 214. (A.B.C.)
badia Walker. *intersistens* Walker. *Ibid.*, 212.
decora Macquart. *Somula.* *Ibid.*, 216. (A.B.C.)
umbratilis Williston. *Cynorhina.* *Ibid.*, 212.

Milesia Latreille.

virginiensis Drury. *ornata.* Syn. N. A. Syrph., 255.

Spilomyia Meigen.

fusca Loew. Syn. N. A. Syrph., 246.
hamifera Loew. *Ibid.*, 247. (A.B.C.)
longicornis Loew. *Ibid.*, 245. (A.B.C.)
quadrifasciata Say. *Ibid.*, 248.

Sphecomyia.

vittata Wiedemann. Syn. N. A. Syrph., 257. (C.W.J.)

Temnostoma St. Fargeau and Serville.

alternans Loew. Syn. N. A. Syrph., 252.
bombylans Fabricius. *Ibid.*, 250. (Ald. Cat.)

* See also appendix.

Ceriodes Rondani.

Ceria Fabricius.

abbreviata Loew. Syn. N. A. Syrph., 261. (S.W.W.)

Eumerus Meigen.

strigatus Fallen. Lunate onion fly. Rept. N. Y. State Ent., 27, 119.

Family CONOPIDÆ.

Conops Linnæus.

brachyrhynchus Macquart. Trans. Conn. Acad. Sci., iv, 341.
sylvosus Williston. *Ibid.*, iv, 329.
xanthopareus Williston. Insect Book, pl. xxi, 37.

Physocephala Schiner.

sagittaria Say. Trans. Conn. Acad. Sci., vi, 391. (C.W.J.)
tibialis Say. Insect Book, pl. xv, 1.

Zodion Latreille.

fulvifrons Say. Insect Book, pl. xxi, 35.

Stylogaster Macquart.

biannulata Say. *Myopa*. Compl. Writ., ii, 72. (S.W.W.)
neglecta Williston. Trans. Conn. Acad. Sci., vi, 91. (S.W.W.)

Dalmannia Robineau-Desvoidy.

nigriceps Loew. Trans. Conn. Acad. Sci., vi, 94. (S.W.W.)

Oncomyia Robineau-Desvoidy.

abbreviata Loew. Trans. Conn. Acad. Sci., vi, 97.
baroni Williston. *Ibid.*, vi, 97. (C.W.J.)
loraria Loew. *Ibid.*, vi, 98.
modesta Williston var. **melanopoda** Williston. *Ibid.*, vi, 96, 393.

Myopa Fabricius.

clausa Loew. Trans. Conn. Acad. Sci., vi, 385.
vesiculosa Say. Compl. Writ., ii, 72.
vicaria Walker. List, iii, 679. (H.L.J.)

Family ŒSTRIDÆ.

Gastrophilus Leach.

equi Clark. Horse bot fly. Bur. Ent., Bull. 5, 76.

Œstrus Linnæus.

ovis Linnæus. Sheep bot fly. Bur. Ent., Bull. 5, 102.

Hypoderma Clark.

bovis DeGeer. Ox warble or bot fly. Bur. Ent., Bull. 5, 95.
lineata DeVilliers. Ent. News, iv, 299.

Cuterebra Clark.

buccata Fabricius. Mon. Œstriden, 247. (C.W.J.)
cuniculi Clark. Bur. Ent., Bull. 5, 108.

Family TACHINIDÆ.

Gymnoclytia Brauer and Bergenstamm.

immaculata Macquart. *Cistogaster.* Revis. Tachinid., 42.
occidua Walker. *Cistogaster.* Smith. Misc. Coll., li, 127.

Gymnosoma Meigen.

fulginosa Desvoidy. Insect Book, pl. xxii, 2.

Phorantha Rondani.

occidentis Walker. Revis. Tachinid., 44.

Alophora Desvoidy.

ænoventris Williston. Revis. Tachinid., 45, 47.
fumosa Coquillett. *Ibid.*, 46. (C.W.J.)

Trichopoda Latreille.

pennipes Fabricius. Insect Book, pl. xv, 25.
plumipes Fabricius. Revis. Tachinid., 48. (A.B.C.)

Myiophasia Brauer and Bergenstamm.

ænea Wiedemann. Revis. Tachinid., 50. (A.B.C.)

Cryptomeigenia Brauer and Bergenstamm.

theutis Walker. Revis. Tachinid., 52.

Dichætoneura Johnson.

* **leucoptera** Johnson. Psyche, xiv, 9.

Polychætoneura Walton.

elyii Walton. Proc. Wash. Ent. Soc., vi, 91.

Actia Desvoidy.

pilipennis Fallen. Revis. Tachinid., 59.

Chætophleps Coquillett.

setosa Coquillett. Revis. Tachinid., 59. (C.W.J.)

Celatoria Coquillett.

spinosa Coquillett. Revis. Tachinid., 60. (C.W.J.)

Hypostena Meigen.

Tachinophyto Tower.

barbata Coquillett. Revis. Tachinid., 62. (C.W.J.)
dunningii Coquillett. *Ibid.,* 60.
flaveola Coquillett. *Ibid.,* 61.
floridensis Townsend. *Ibid.,* 62.
variabilis Coquillett. *Ibid.,* 62.

Macquartia Desvoidy.

pristis Walker. Revis. Tachinid., 64.

Polidea Macquart.

areos Walker. Revis. Tachinid., 64.

Leskia Desvoidy.

analis Say. Revis. Tachinid., 67. (A.B.C.)
thecata Coquillett. *Ibid.,* 67. (A.B.C.)

Leskiomima Brauer and Bergenstamm.

tenera Wiedemann. Revis. Tachinid., 67.

Leucostoma Meigen.

senilis Townsend. Revis. Tachinid., 69. (C.W.J.)

Hyalomyodes Townsend.

triangulifera Loew. Revis. Tachinid., 70.

Œstrophasia Brauer and Bergenstamm.

signifera Van der Wulp. Biol. Dipt., ii, 167. (H.L.J.)

Xanthomelanodes Townsend.

arcuata Say. *Xanthomelana.* Revis. Tachinid., 75. (H.L.V.)

Hemyda Desvoidy.

aurata Desvoidy. Revis. Tachinid., 73.

Eutrixa Coquillett.

exile Coquillett. Revis. Tachinid., 72. (C.W.J.)

Epigrymyia Townsend.

polita Townsend. Trans. Am. Ent. Soc., xviii, 376. (C.W.J.)

Siphona Meigen.

brevirostris Coquillett. Revis. Tachinid., 76. (C.W.J.)
geniculata DeGeer. *Ibid.*, 75.

Cyrtophlœba Rondani.

horrida Coquillett. Revis. Tachinid., 78.

Paraplagia Brauer and Bergenstamm.

spinosula Bigot. Revis. Tachinid., 77. (W.E.B.)

Senotainia Macquart.

trilineata Van der Wulp. Revis. Tachinid., 81.

Belvosia Desvoidy.

bifasciata Fabricius. Smith Misc. Coll., li, 104. (C.W.J.)

Goniomima Townsend.

unifasciata Desvoidy. Revis. Tachinid., 84. (A.B.C.)

Melanophrys Williston.

insolita Walker. Revis. Tachinid., 85. (C.W.J.)

Ocyptera Latreille.

carolinæ Desvoidy. Insect Book., pl. xv, 29.
dosiades Walker. Revis. Tachinid., 86.

Linnæmyia Desvoidy.

hæmorrhoidalis Fallen. *picta* Meigen. Revis. Tachinid., 87.

Bonnetia Desvoidy.

compta Fallen. Revis. Tachinid., 87.

Ernestia Desvoidy.

Panzeria.

radicum Fabricius. Insect Book, pl. xv, 28.
ruficauda Brauer. *Hystricia. aldrichii* Townsend. Smith. Misc. Coll., li, 109. (H.E.S.)

Macromeigenia Brauer and Bergenstamm.

chrysoprocta Wiedemann. Revis. Tachinid., 89. (A.B.C.)

Gymnochæta Desvoidy.

alcedo Loew. Cent., viii, 61.
fuficornis Williston. Trans. Am. Ent. Soc., xiii, 302. (C.W.J.)

Exoristoides Coquillett.

slossonæ Coquilett. Revis. Tachinid., 90. (H.E.S.)

Exorista Meigen.

boarmiæ Coquillett. Revis. Tachinid., 95. (H.E.S.)
confinis Fallen. *Ibid.*, 97.
eudryæ Townsend. *Ibid.*, 100. (C.W.J.)
futilis Osten Sacken. *Ibid.*, 98. (S.W.W.)
petiolata Coquillett. *Ibid.*, 98.
cheloniæ Rondani. *Ibid.*, 92. (H.E.S.)
vulgaris Fallen. *Ibid.*, 93. (H.E.S.)
pyste Walker. *Ibid.*, 93.

Compsilura Bouché.

concinnata Meigen. U. S. Dept. Agr., Bull. 204, fig. 2.

Phorocera Desvoidy.

claripennis Macquart. Insect Book, pl. xxii, 6.
erecta Coquillett. Proc. U. S. Nat. Mus., xxv, 112.

Neopales Coquillett.

einaris Smith. Proc. Wash. Ent. Soc., xiv, 119.
slossonæ Townsend. Smith. Misc. Coll., li, 108. (H.E.S.)
leucaniæ Coquillett. Revis. Tachinid., 104. (C.W.J.)
tortricis Coquillett. *Ibid.*, 103. (A.B.C.)

Doryphorophaga Townsend.

doryphoræ Riley. Revis. Tachinid., 104.

Frontina Meigen.

aberrans Townsend. Ent. News., xxvii, 217.
aletiæ Riley. Can. Ent., xi, 162.
ancilla Walker. Revis. Tachinid., 106.
frenchii Williston. *Ibid.*, 107.

Sturmia Desvoidy.

albifrons Walker. Revis. Tachinid., 109.
nidicola Townsend. *Zygobothria*. Bur. Ent., Bull. 91, 289.
nigrita Townsend. Trans. Am. Ent. Soc., xviii, 358.
phyciodis Coquillett. Revis. Tachinid., 109. (C.W.J.)

Masicera Macquart.

myoidea Desvoidy. Revis. Tachinid., 114.
rutila Meigen. *Ibid.*, 114. (H.L.V.)

Acemyia Desvoidy.

dentata Coquillett. Revis. Tachinid., 116. (D.W.C.)

Tachina Meigen.*

mella Walker. Revis. Tachinid., 119.
robusta Townsend. *Ibid.*, 119.
rustica Fallen. *Ibid.*, 119.

Neofischeria Townsend.

flava Townsend. Taxonomy, 75. (C.W.J.)

Blepharipeza Macquart.

adusta Loew. Insect Book, pl. xxii, 18, 22. (A.B.C.)
leucophrys Wiedemann. Revis. Tachinid., 124.

Winthemia Desvoidy.

quadripustulata Fabricius. Insect Book, pl. xxii, 4.

Paradidyma Brauer and Bergenstamm.

singularis Townsend. Revis. Tachinid., 126.

Metachæta Coquillett.

helymus Walker. Revis. Tachinid., 126.

Phorichæta Rondani.

sequax Williston. Revis. Tachinid., 126. (B.H.W.)

Metopia Meigen.

lateralis Macquart. Revis. Tachinid., 127. (C.W.J.)
leucocephala Rossi. Can. Ent., xliii, 314; xliv, 170.

Araba Desvoidy.

tergata Coquillett. Jour. N. Y. Ent. Soc., iii, 103. (G.D.)

Opsidia Coquillett.

gonoides Coquillett. Revis. Tachinid., 128. (J.A.H.)

Hilarella Rondani.

fulvicornis Coquillett. Revis. Tachinid., 128. (H.L.V.)
polita Townsend. *Ibid.*, 129.

Brachycoma Rondani.

apicalis Coquillett. Revis. Tachinid., 131. (D.W.C.)

Gonia Meigen.

capitata DeGeer. Insect Book, pl. xv, 26, 31.
distincta H. E. Smith. Psyche, xxii, 99.
senilis Williston. Can. Ent., xix, 10.

Spallanzania Desvoidy.

bucephala Meigen. *hebes* Rondani. Revis. Tachinid., 135. (C.W.J.)
hesperidarum Williston. *Ibid.*, 135.

* See also appendix.

Gædiopsis Brauer and Bergenstamm.

ocellaris Coquillett. Proc. U. S. Nat. Mus., xxv, 118. (A.B.C.)

Microphthalma Macquart.

disjuncta Wiedemann. Revis. Tachinid., 138.

Tricophora Macquart.

ruficauda Van der Wulp. Revis. Tachinid., 139.

Cuphocera Macquart.

fucata Van der Wulp. Revis. Tachinid., 140.
prompta Zetterstedt. *Ibid.*, 141.

Peleteria Desvoidy.

robusta Wiedemann. Revis. Tachinid., 141.
prompta Zetterstedt. *Ibid.*, 141.

Archytas Jænnicke.

analis Fabricius. Insect Book, pl. xxii, 10.
aterrima Desvoidy. *Ibid.*, pl. xv, 33.
hystrix Fabricius. Revis. Tachinid., 142.
lateralis Macquart. Insect Book, pl. xxii, 14.

Echinomyia Dumeril.

algens Wiedemann. Insect Book, pl. xv, 27.
decisa Walker. Revis. Tachinid., 143. (S.W.W.)
florum Walker. *Ibid.*, 144. (H.L.J.)

Epalpus Rondani.

signifera Walker. Insect Book., pl. xxii, 12.

Bombyliomyia Brauer and Bergenstamm.

abrupta Wiedemann. Insect Book, pl. xv, 22.

Jurinia Desvoidy.

adusta Van der Wulp. *metallica*. Insect Book, pl. xv, 27; pl. xxii, 16, 27.

Family DEXIIDÆ.

Myiocera Desvoidy.

simplex Bigot? Annales, 1888, 266.

Melanophora Meigen.

roralis Linnæus. Syst. Beschr., iv, 284.

Ptilodexia Brauer and Bergenstamm.

harpasa Walker. *tibialis*. *Myiocera*. Myodaires, 306.

Thelaira Desvoidy.

leucozona Panzer. Insect Book., pl. xxii, 24.

Theresia Desvoidy.

tandrec Desvoidy. Myodaires, 326.

Family SARCOPHAGIDÆ.

Sarcophaga Meigen.

bullata Parker. Can. Ent., xlviii, 359.
cimbicis Townsend. *Ibid.*, xxiv, 126.
communis Parker. Proc. Bos. Soc. Nat. Hist., 35, 55.
fernaldi Parker. *Ibid.*, 35, 72.
hæmorrhoidalis Fallen. Sarcoph. N. A., 189.
helicis Townsend. *Ibid.*, 158.
latisetosa Parker. Proc. Bos. Soc. Nat. Hist., 35, 63.
latisterna Parker. *Ibid.*, 35, 67. (C.W.J.)
peniculata Parker. *Ibid.*, 35, 58.
quadrisetosa Coquillett. *Helicobia*. Ent. News, xii, 17.
scoparia Pandellé. Sarcoph. N. A., 214.
scoparia var. **nearctica** Parker. Can. Ent., xlviii, 422.
sinuata Meigen. Sarcoph. N. A., 67.
tuberosa Pandelé var. **sarracenioides** Aldrich. *Ibid.*, 227.

Sarcofahrtia Parker.

atlantica Parker. Ent. News. xxxiii, 203.
ravinia Parker. Psyche, xxiii, 131.

Family MUSCIDÆ.

Pollenia Desvoidy.

rudis Fabricius. Cluster fly. Insect Book, pl. xxii, 28.

Chrysomyia Desvoidy.

macellaria Fabricius. Screw worm fly. La. Agr. Expt. Sta Bull. 2, Sec. ser.

Cynomyia Desvoidy.

cadaverina Desvoidy. Insect Book, pl. xv, 21.

Calliphora Desvoidy.

erythrocephala Meigen. Common blow fly. Insect Book, pl. xv, 16.

vomitoria Linnæus. Blue bottle fly. Minn. Agr. Expt. Sta., Bull. 48, 188.

Protocalliphora Hough.

azurea Fallen. Zool. Bull., ii, 289. (C.W.J.)

Lucilia Desvoidy.

cæsar Linnæus. Insect Book, pl. xv, 20.
sericata Meigen. *Musca*. Syst. Beschr., v, 53.
sylvarum Meigen. *Ibid.*, v, 53.

Phormia Desvoidy.

regina Meigen. *Musca*. Syst. Beschr., v., 58.
terræ-novæ Desvoidy. Zool. Bull., ii, 289.

Orthellia Desvoidy.
Pseudopyrellia Girschner.

cornicina Fabricius. Syst. Beschr., v, 57.

Pyrellia Desvoidy.

serena Meigen. *cyanicolor* Zetterstedt. Dipt. Scand., iv, 1323.

Morellia Desvoidy.

micans Macquart. Insect Book., pl. xv, 11.

Musca Linnæus.

domestica Linnæus. House fly. Insect Book, pl. xv, 6.

Graphomyia Desvoidy.

maculata Scopoli. Syst. Beschr., v, 78.

Stomoxys Geoffroy.

calcitrans Linnæus. Biting house fly. Proc. Bost. Soc. Nat. Hist., xvi, 136.

Hæmatobia St. Fargeau and Serville.

irritans Linnæus. *serrata*. *cornicola*. Horn fly. Rept. N. Y. State Ent., No. 5, 220.

Myiospila Rondani.

meditabunda Fabricius. Syst. Beschr., v, 79.

Muscina Desvoidy.

assimilis Fallen. Syst. Beschr., v, 76. (H.L.V.)
stabulans Fallen. Stable fly. Insect Book, pl. xxii, 33.

Family ANTHOMYIDÆ.

Hydrotæa Desvoidy.

armipes Fallen. Fauna Aust., i, 616. (H.L.V.)

Ophyra Desvoidy.

leucostoma Wiedemann. Syst. Beschr., v, 160.

Fannia Desvoidy.

Homalomyia Bouché.

canalicularis Linnæus, Fauna Aust., i, 654. (C.W.J.)
scalaris Fabricius. Syst. Beschr., v, 141.

Hyetodesia Rondani.

deleta Stein. Berl. Ent. Zeitsch., xlii, 178. (C.W.J.)
lucorum Fallen. Syst. Beschr., v, 85. (H.L.V.)

Spilogaster Macquart.

uniseta Stein. Berl. Ent. Zeitsch., vlii, 192. (H.L.J.)
urbana Meigen. *Ibid.*, xlii, 196.

Limnophora Desvoidy.

diaphana Wiedemann. Syst. Beschr., v, 189.
narona Walker. *Cyrtoneurina.* Berl. Ent. Zeitsch., xvii, 203.

Anthomyia Meigen.

albicincta Fallen. Syst. Beschr., v, 161.
pluvialis Linnæus. *Ibid.*, v, 163. (H.L.J.)
pratincola Panzer. *Ibid.*, v, 163.
radicum Linnæus. Rept. N. Y. State Ent., No. 1, 191.

Hylemyia Desvoidy.

alcathoe Walker. List., iv, 937. (C.W.J.)
johnsoni Stein. Berl. Ent. Zeitschr., xvii, 215, 285. (C.W.J.)

Phorbia Desvoidy.

brassicæ Bouché. Cabbage maggot. Cornell Agr. Expt. Sta., Bull. 78; Rept. Conn. Agr. Expt. Sta., 1914, 142.
ceparum Meigen. Onion maggot. Rept. Conn. Agr. Expt. Sta., 1911, 286.
cepetorum Meade. Ent. Monthl. Mag., 1882, 218. (C.W.J.)
cinerella Fallen. Proc. Wash. Acad. Sci., ii, 583.
fusciceps Zetterstedt. *cilicrura.* Seed-corn maggot. Bur. Ent., Bull. 43, 68.

latipennis Zetterstedt. Dipt. Scand., iv, 1509. (C.W.J.)
rubivora Coquillett. Raspberry cane maggot. Rept. Conn. Agr. Expt. Sta., 1902, 167.

Pegomyia Desvoidy.

calyptrata Zetterstedt. Berl. Ent. Zeitschr., xlii, 237.
hyoscyami Panzer. *vicina* Lintner. Beet or spinach leaf-miner. Ins. Life, vii, 379.
vittiger Zetterstedt. Ins. Lapp., 1838, 164, 697.
winthemi Meigen. *latitarsis* Zetterstedt. Fauna Aust., i, 635. (C.W.J.)

Dialyta Meigen.

flavitibia Johannsen. Trans. Am. Ent. Soc., lxii, 394.

Caricea Desvoidy.

albicornis Meigen. Fauna Aust., i, 664. (C.W.J.)

Cœnosia Meigen.

ausoba Walker. Berl. Ent. Zeitschr., xlii, 260.
calopyga Loew. Cent., x, 71. (C.W.J.)
flavipes Stein. Berl. Ent. Zeitschr., xlii, 268.
lata Walker. Dipt. Saund., 368.
nivea Loew. Cent., x, 70.
tibialis Stein. Berl. Ent. Zeitschr., xlii, 275. (C.W.J.)

Dexiopsis Pokorny.

lacteipennis Zetterstedt. Dipt. Scand., iv, 1722.

Schœnomyza Halliday.

chrysostoma Loew. Cent., ix, 86.
dorsalis Loew. Cent., x, 73.

Lispa Latreille.

albitarsis Stein. Berl. Ent. Zeitschr., xlii, 277. (C.W.J.)
uliginosa Fallen. Fauna Aust., i, 661.

Fucellia Desvoidy.

marina Macquart. *fucorum*. Proc. Wash. Acad. Sci., ii, 453.

Family SCATOPHAGIDÆ.

Cordylura Fallen.

adusta Loew. Cent., iii, 41.
confusa Loew. *Ibid.*, iii, 43. (C.W.J.)
gilvipes Loew. *Ibid.*, iii, 49. (C.W.J.)
munda Loew. *Ibid.*, iii, 91.

pleuritica Loew. *Ibid.*, iii, 42. (A.B.C.)
setosa Loew. *Ibid.*, iii, 44.
slossonæ Coquillett. Jour. N. Y. Ent. Soc., vi, 164. (H.L.J.
variabilis Loew. Zeitsch. f. Ges Naturwiss, 1876, 326.

Mosina Desvoidy.

variapes Walker. List. Dipt., 4, 1046. (H.L.J.)

Scatophaga Meigen.

furcata Say. Compl. Writ., ii, 85.
merdaria Fabricius. Dipt. Scand., v, 1970. (C.W.J.)
stercoraria Linnæus. Insect Book, pl. xv, 19.

Family HETERONEURIDÆ.

Clusia Halliday.

lateralis Walker. *spectabilis*. Cent., iv. 92.

Family HELOMYZIDÆ.

Helomyza Fallen.

quinquepunctata Say. Compl. Writ., ii, 86. (C.W.J.)

Scoliocentra Loew.

helvola Loew. Cent., ii, 80.

Œcothea Haliday.

fenestralis Fallen. Syst. Beschr., vi, 56.

Tephrochlamys Loew.

rufiventris Meigen. Syst. Beschr., vi, 58.

Family BORBORIDÆ.

Leptocera Olivier.

Limosina Macquart.

limosa Meigen. Syst. Beschr., vi, 207.

Borborus Meigen.

equinus Fallen. Proc. Wash. Acad. Sci., ii, 594.

Sphærocera Latreille.

subsultans Fabricius. Proc. Wash. Acad. Sci., ii, 596.

Family DRYOMYZIDÆ.

Neuroctena Rondani.

anilis Fallen. *Dryomyza pallida* Day. Can. Ent., xiii, 89. (S.W.W.)

Family SCIOMYZIDÆ.*

Sciomyza Fallen.

nana Fallen. Mon. N. A. Dipt., i, 104.
pubera Loew. *Ibid.*, i, 106. (H.L.V.)

Pœcilomyia Melander.

decora Loew. *Sapromyza.* Cent., v, 96.

Hedroneura Hendel.

rufa Panzer. *lineata* Day. Can. Ent., xiii, 88.

Tetanocera Dumeril.

arcuata Loew. Mon. N. A. Dipt., i, 115. (C.W.J.)
clara Loew. Insect Book, pl. xxii, 36. (A.B.C.)
combinata Loew. Can. Ent., xiii, 85.
pallida Loew. Mon. N. A. Dipt., i, 113.
plebeia Loew. *Ibid.*, i, 120.
plumosa Loew. Insect Book, pl. xv, 14.
saratogensis Fitch. Ins. N. Y., 68.
setosa Coquillett. Proc. U. S. Nat. Mus., xxiii, 615. (C.W.J.)
sparsa Loew. Mon. N. A. Dipt., i, 117. (S.W.W.)
umbrarum Linnæus. Can. Ent., xiii, 85.
valida Loew. Mon. N. A. Dipt., i, 110. (A.B.C.)

Sepedon Latreille.

armipes Loew. Mon. N. A. Dipt., 1, 126. (C.W.J.)
fuscipennis Loew. Insect Book, pl. xxii, 41.
pusillus Loew. Mon. N. A. Dipt., i, 127.

Family SAPROMYZIDÆ.

Lonchæa Fallen.

polita Say. Compl. Writ., ii, 371. (A.B.C.)
rufitarsus Macquart. Dipt. Exot. (Suppl.), iv, 300.

Lauxania Latreille.

cylindriformis Fabricius. Proc. Wash. Acad. Sci., ii, 400.
gracilipes Loew. Cent., i, 84. (C.W.J.)
obscura Loew. *Ibid.*, i, 84.

* See also appendix.

Minettia Desvoidy.

annulata Melander. Psyche, xx, 73. (C.W.J.)
lupulina Fabricius. Proc. Wash. Acad. Sci., ii, 460.
quadrilineata Loew. Cent., i, 78.
valida Walker. *macula* Loew. *Ibid.*, x, 82. (C.W.J.)

Sapromyza Fallen.

compedita Loew. Cent., i, 76.
disjuncta Johnson. Psyche, xxi, 22. (C.W.J.)
fraterna Loew. Cent., i, 77. (C.W.J.)
houghii Coquillett. Can. Ent., xxx, 277.
notata Fallen. Psyche, xx, 68. (C.W.J.)
philadelphica Macquart. Dipt. Exot. (Suppl.), ii, 3, 191.

Camptoprosopella Hendel.

vulgaris Fitch. Ins. N. Y., i, 300.

Family ORTALIDÆ.

Pyrgota Wiedemann.

chagnoni Johnson. Can. Ent., xxxii, 246. (A.B.C.)
undata Wiedemann. Insect Book, pl. xv, 4.
valida Harris. *Ibid.*, pl. xv, 9.

Amphicnephes Loew.

pulla Wiedemann. *pertusus*. Mon. N. A. Dipt., iii, 84.

Rivellia Desvoidy.

conjuncta Loew. Mon. N. A. Dipt., iii, 88.
flavimanus Loew. *Ibid.*, iii, 92.
pallida Loew. *Ibid.*, iii, 95.
quadrifasciata Macquart. *Ibid.*, iii, 90.
viridulans Desvoidy. *Ibid.*, iii, 88.

Myrmecothea Hendel.

Myrmecomyia Desvoidy.

myrmecoides Loew. Mon. N. A. Dipt., iii, 100. (A.B.C.)

Tritoxa Loew.

flexa Wiedemann. Mon. N. A. Dipt., iii, 102.
incurva Loew. Insect Book, pl. xxii, 40.

Camptoneura Macquart.

picta Fabricius. Insect Book, pl. xv, 10.

Idana Loew.

marginata Say. Compl. Writ., ii, 368. (A.B.C.)

Tephronota Loew.

narytia Walker. *ruficeps. humilis.* Mon. N. A. Dipt., iii, 123. (C.W.J.)

Melieria Desvoidy.

similis Loew. Mon. N. A. Dipt., iii, 127. (C.W.J.)

Tetanops Fallen.

luridipennis Loew. Mon. N. A. Dipt., iii, 119. (C.W.J.)

Callopistria Loew.

annulipes Macquart. Mon. N. A. Dipt., iii, 141. (C.W.J.)

Pseudotephritis Johnson.

corticalis Loew. Mon. N. A. Dipt., iii, 136. (C.W.J.)

Chrysomyza Fallen.

demandata Fabricius. Fauna Aust., ii, 85.

Euxesta Loew.

notata Wiedemann. Mon. N. A. Dipt., iii, 156.

Chætopsis Loew.

ænea Wiedemann. Compl. Writ., ii, 368.

apicalis Johnson. Ent. News, xi, 326.

fulvifrons Macquart. Dipt. Exot. (Suppl.), v, 125. (C.W.J.)

Seoptera Kirby.

vibrans Linnæus. Mon. N. A. Dipt., ii, 153.

Stenomyia Loew.

tenuis Loew. Mon. N. A. Dipt., iii, 173.

Eumetopia Macquart.

rufipes Macquart. Mon. N. A. Dipt., iii, 175.

Family TRYPETIDÆ.

Straussia Desvoidy.

longipennis Wiedemann. Mon. N. A. Dipt., i, 65.

Stenopa Loew.

vulnerata Loew. Mon. N. A. Dipt., iii, 232. (Psyche.)

Acidia Desvoidy.

fratria Loew. Mon. N. A. Dipt., i, 67. (C.W.J.)

suavis Loew. *Ibid.*, iii, 235. (C.W.J.)

Spilographa Loew.

electa Say. Compl. Writ., ii, 396. (Ald. Cat.)

Œdaspis Loew.

atra Loew. Cent., ii, 74.
polita Loew. Mon. N. A. Dipt., i, 77. (Ald. Cat.)

Rhagoletis Loew.

cingulata Loew. *Trypeta.* Cherry maggot. Cornell Agr. Expt. Sta., Bull. 172.
pomonella Walsh. Apple maggot. Railroad worm. Rept. Me. Agr. Expt. Sta., 1889, 190; Rept. Conn. Agr. Expt. Sta., 1909-10, 593.

Eutreta Loew.

sparsa Wiedemann. Compl. Writ., ii, 370.

Eurosta Loew.

comma Wiedemann. Mon. N. A. Dipt., i, 93.
conspurcata Doane. Jour. N. Y. Ent. Soc., vii, 186.
elsa Dæcke. Ent. News, xxi, 342.
latifrons Loew. Mon. N. A. Dipt., i, 89.
reticulata Snow. Kans. Univ. Quart., ii, 170.
solidaginis Fitch. Mon. N. A. Dipt., i, 82.

Aciura Desvoidy.

limata Coquillett. Jour. N. Y. Ent. Soc., vii, 263. (C.W.J.)

Icterica Loew.

seriata Loew. Mon. N. A. Dipt., i, 84.

Tephritis Latreille.

platyptera Loew. Mon. N. A. Dipt., iii, 306.

Neaspilota Osten Sacken.

albidipennis Loew. Cent., i, 73. (C.W.J.)

Euaresta Loew.

bella Loew. Mon. N. A. Dipt., ii, 88.
festiva Loew. *Ibid.,* i, 86.
pura Loew. *Ibid.,* iii, 320. (H.L.J.)

Family MICROPEZIDÆ.

Tæniaptera Macquart.

antennipes Say. Compl. Writ., ii, 83.
divaricata Cresson. Ent. News., xxv, 459. (C.W.J.)

Calobata Meigen.

alesia Walker. List. iv, 1048. (C.W.J.)
univitta Walker. *Ibid.*, iv, 1049. (C.W.J.)

Family SEPSIDÆ.

Sepsis Fallen.

neocynipsea Melander. Wash. Agr. Expt. Sta., Bull. 143, 28.
signifera Melander. *curvitibia* Melander. *Ibid.*, Bull. 143, 28.
violacea Meigen. *Ibid.*, Bull. 143, 20.

Nemopoda Desvoidy.

cylindrica Fabricius. Syst. Beschr., v, 290.

Meroplius Rondani.

stercoraria Desvoidy. *Nemopoda minuta.* Myodaires, 745.

Themira Desvoidy.

flavicoxa Melander. Wash. Agr. Expt. Sta., Bull. 143, 46.

Piophila Fallen.

casei Linnæus. Cheese skipper. Rept. N. Y. State Ent., xii, 229.

Family PSILIDÆ.

Loxocera Meigen.

cylindrica Say. Compl. Writ., ii, 84. (H.L.V.)
pectoralis Loew. Cent., viii, 64. (A.B.C.)
pleuritica Loew. *Ibid.*, viii, 65. (C.W.J.)
pleuritica var. **obsoleta** Johnson. Psyche, xxvii, 16.

Chyliza Fallen.

apicalis Loew. Cent., viii, 72. (C.W.J.)
notata Loew. *annulipes* Macquart. *Ibid.*, ix, 99. (A.B.C.)

Psila Meigen.

bivittata Loew. Cent., viii, 67. (Ald. Cat.)
collaris Loew. *Ibid.*, viii, 68. (Ald. Cat.)

Family DIOPSIDÆ.

Sphyracephala Say.

brevicornis Say. Compl. Writ., i, 116. (C.W.J.)

Family EPHYDRIDÆ.

Dichæta Meigen.

caudata Fallen. Mon. N. A. Dipt., i, 133.

Notiphila Fallen.

bella Loew. Mon. N. A. Dipt., i, 135. (C.W.J.)
bispinosa Cresson. Trans. Am. Ent. Soc., xliii, 58.
scalaris Loew. Mon. N. A. Dipt., i, 134.
olivacea Cresson. Trans. Am. Ent. Soc., xliii, 52.

Gastrops Williston.

nebulosa Coquillett. Can. Ent. xxxii, 34.

Typopsilopa Cresson.

atra Loew. Mon. N. A. Dipt., i, 142.

Hydrellia Desvoidy.

formosa Loew. Cent., i, 94.

Psilopa Fallen.

atrimanus Loew. Zeitsch. f. Ges. Naturwiss., 1878, 197.
flavida Coquillett. Can. Ent., xxxii, 33. (C.W.J.)

Ilythea Haliday.

spilota Curtis. Brit. Ent., 413. (C.W.J.)

Ochthera Latreille.

mantis DeGeer. Ent. News., vii, 123. (W.M.W.)

Parydra Stenhammar.

bituberculata Loew. Mon. N. A. Dipt., i, 165.
breviceps Loew. *Ibid.*, i, 167.
imitans Loew. Zeitsch. f. Ges., Naturwiss., 1878, 201.

Mosillus Latreille.

tibialis Cresson. Ent. News, xxvii, 149.

Ephydra Fallen.

atrovirens Loew. Mon. N. A. Dipt., i, 169.
subopaca Loew. Cent., v, 99.

Cirrula Cresson.

gigantea Cresson. Ent. News, xxvi, 71. (C.W.J.)

Scatella Desvoidy.

lugens Loew. Mon. N. A. Dipt., i, 171.
stagnalis Fallen. Proc. Wash. Acad. Sci., ii, 462.

Dimecænia Cresson.

spinosa Loew. Cent. v, 100.

Family CHLOROPIDÆ.

Meromyza Meigen.

americana Fitch. Greater wheat stem maggot. Bur. Ent., Bull. 42, New ser., 43.
flavipalpis Malloch. Can. Ent., xlvi, 117. (C.W.J.)

Chlorops Meigen.

abdominalis Coquillett. Proc. Acad. Nat. Sci. Phila., 1895, 318. (C.W.J.)
crocota Loew. Cent., iii, 89. (C.W.J.)
melanocera Loew. *Ibid.*, iii, 91.
rufescens Coquillett. Can. Ent., xlii, 45. (C.W.J.)

Chloropisca Loew.

glabra Meigen. *assimilis* Macquart. Jour. N. Y. Ent. Soc., vi, 47.
grata Loew. Cent., iii, 92. (C.W.J.)
variceps Loew. *Ibid.*, iii, 86. (H.L.V.)

Parectecephala Becker.

eucera Loew. Cent., iii, 85.

Cetema Hendel.

procera Loew. Cent., x, 92. (C.W.J.)

Anthracophaga Loew.

sanguinolenta Loew. Cent., iii, 84.

Diplotaxa Loew.

versicolor Loew. Cent., iii, 97.

Hippelates Loew.

flavipes Loew. Cent., vii, 95.
nobilis Loew. *Ibid.*, iii, 97.
pusio Loew. *Ibid.*, x, 87.

Crassiseta Von Roser.
Elachiptera Macquart.

costata Loew. Cent., iii, 62.

Melanochæta Bezzi.

eunota Loew. *Ibid.*, x, 89. (C.W.J.)
longula Loew. *Ibid.*, iii, 84.

Siphonella Macquart.

cinerea Loew. Cent., iii, 81. (C.W.J.)
lævigata Fallen. Fauna Aust., ii, 229. (C.W.J.)

Botanobia Livy.

Oscinis Latreille.

coxendix Fitch. Ins. N. Y., 301.
soror Macquart. American frit-fly. Bur. Ent., Bull. 42, New ser., 57.

Family DROSOPHILIDÆ.

Phortica Schiner.

vittata Coquillett. Proc. U. S. Nat. Mus., xxiii, 618. (C.W.J.)

Drosophila Fallen.

adusta Loew. *Scaptomyza*. Native cabbage leaf-miner. Bur. Ent., New ser., Bull. 33, 76.
amœna Loew. Pretty pomace fly. Rept. U. S. Dept. Agr., 1881-2, 201.
ampelophila Loew. *melanogaster* Meigen. Vine-loving pomace fly. *Ibid.*, 1881-2, 198.
busckii Coquillett. Ent. News, xii, 18. (C.W.J.)
flaveola Meigen. *Scaptomyza*. Imported turnip leaf-miner. Bur. Ent., New ser., Bull. 33, 75.
funebris Fabricius. Proc. U. S. Nat. Mus., xxii, 264.
graminum Fallen. *Scaptomyza*. Imported cabbage leaf-miner. Bur. Ent., New ser., Bull. 33, 76.
ordanaria Coquillett. Proc. Ent. Soc. Wash., vi, 190. (C.W.J.)
quinaria Loew. Cent., vi, 90.

Family GEOMYZIDÆ.

Diastata Meigen.

nebulosa Fallen. Syst. Beschr., vi, 98.

Family AGROMYZIDÆ.

Phytomyza Fallen.

aquilegiæ Hardy. Columbine leaf-miner. Rept. Conn. Agr. Expt. Sta., 1894, 145.
diminuta Walker. Trans. Ent. Soc. Lond., New ser., iv, 232.

Napomyza Haliday.

chrysanthemi Kowarz. *Phytomyza*. Chrysanthemum leaf-miner. Bur. Ent., Bull. 10, New ser., 79.

Cerodontha Rondani.

dorsalis Loew. *Odontocera*. *Ceratomyza*. Corn leaf-miner. Rept. Conn. Agr. Expt. Sta., 1894, 143.

Agromyza Fallen.

æneiventris Fallen. Bur. Ent., Bull. 10, New ser., 78.
angulata Loew. Ann. Ent. Soc., Am., vi, 304.
longispinosa Malloch. *Ibid.*, vi, 276. (C.W.J.)
melampyga Loew. *Ibid.*, vi, 282. (C.W.J.)
parvicornis Loew. *Ibid.*, vi, 312.
platyptera Thomson. *coronata* Loew. *Ibid.*, vi, 293.
posticata Meigen. *terminalis* Coquillett. *Ibid.*, vi, 308.
pusilla Meigen. *dimidiata* Walker. *trifolii* Burgess. *Ibid.*, vi, 278.
simplex Loew. N. Y. Agr. Expt. Sta., Bull. 189; Ann. Ent. Soc. Am., vi, 315.

Mallochiella Melander.

halteralis Coquillett. *Desmometopa*. Proc. U. S. Nat. Mus., xxii, 267.

Desmometopa Loew.

latipes Meigen. Jour. N. Y. Ent. Soc., xxi, 241.
m-nigrum Zetterstedt. *Ibid.*, xxi, 241.

Rhynchomilichia Hendel.

indecora Loew. *Milichia*. Proc. U. S. Nat. Mus., xxii, 263.

Odinia Desvoïdy.

maculata Meigen. Jour. N. Y. Ent. Soc., xxi, 248. (A.B.C.)
picta Loew. Cent., i, 99; Jour. N. Y. Ent. Soc., xxi, 248. (C.W.J.)

Leucopis Meigen.

nigricornis Egger. Jour. N. Y. Ent. Soc., xxi, 232. (C.W.J.)

Ochthiphila Fallen.

elegans Panzer. Jour. N. Y. Ent. Soc., xxi, 233. (C.W.J.)
polystigma Meigen. *Ibid.*, xxi, 233.

Family HIPPOBOSCIDÆ.

Olfersia Wiedemann.

americana Leach. *Hippobosca bubonis.* Pack. Guide, 417.

Melophagus Latreille.

ovinus Linnæus. Sheep tick. Bur. Ent., Bull. 5, New ser., 138.

Order **COLEOPTERA.**

Beetles.

Family CICINDELIDÆ.

Cicindela Linnæus.

duodecimguttata Dejean. Coleop. Ind., 34. (E.D.H.)
formosa Say var. **generosa** Dejean. *Ibid.,* 33.
hirticollis Say. *Ibid.,* 35. (G.D.)
punctulata Fabricius. *Ibid.,* 35.
puritana Horn. Trans. Am. Ent. Soc., xxvii, 164.
purpurea Olivier. Coleop. Ind., 33.
purpurea var. **limbalis** Klug. *Ibid.,* 33.
repanda Dejean. *Ibid.,* 34.
sexguttata Fabricius. *Ibid.,* 32.
sexguttata var. **harrisii** Leng. Trans. Am. Ent. Soc., xxviii, 128. (E.D.H.)
tranquebarica Herbst. *vulgaris.* Coleop. Ind., 33.

Family CARABIDÆ.

Cychrus Fabricius.

elevatus Fabricius. Coleop. Ind., 43.
lecontei Dejean. *Ibid.,* 43.
viduus Dejean. *Ibid.,* 42.

Carabus Linnæus.

limbatus Say. Coleop. Ind., 45.
nemoralis Mulsant. Jour. N. Y. Ent. Soc., ii, 139.
serratus Say. Coleop. Ind., 45.
sylvosus Say. *Ibid.,* 45.
vinctus Weber. *Ibid.,* 45.

Calosoma Weber.

calidum Fabricius. Coleop. Ind., 47.
externum Say. *Ibid.,* 46.

frigidum Fabricius. *Ibid.*, 47.
scrutator Fabricius. Caterpillar hunter. *Ibid.*, 47.
sycophanta Linnæus. Bur. Ent., Bull. 101.
willcoxi LeConte. Coleop. Ind., 47.

Elaphrus Fabricius.

cicatricosus LeConte. Coleop. Ind., 49. (C.S.)
fuliginosus Say. *Ibid.*, 49. (A.B.C.)
ruscarius Say. *Ibid.*, 49. (A.B.C.)

Notiophilus Dumeril.

æneus Herbst. Coleop. Ind., 51.
novemstriatus LeConte. *Ibid.*, 52.
semistriatus Say. *Ibid.*, 51.

Nebria Latreille.

pallipes Say. Coleop. Ind., 53.

Scarites Fabricius.

subterraneus Fabricius. Coleop. Ind., 56.

Dyschirius Bonelli.

globulosus Say. Coleop. Ind., 57. (A.B.C.) (C.C.)
hæmorrhoidalis Dejean. *Ibid.*, 58. (C.C.)
hispidus LeConte. *Ibid.*, 58. (A.B.C.)
sphæricollis Say. *Ibid.*, 58.

Clivina Latreille.

americana Dejean. Coleop. Ind., 61.
bipustulata Fabricius. *Ibid.*, 61.
impressifrons LeConte. *Ibid.*, 60.
rubicunda LeConte. *Ibid.*, 60.

Schizogenius Putzeys.

ferrugineus Putzeys. Coleop. Ind., 62. (CC..)
lineolatus Say. *Ibid.*, 62. (C.C.)

Panageus Latreille.

fasciatus Say. Coleop. Ind., 66. (G.D.) (C.C.)

Bembidion Latreille.

americanum Dejean. Coleop. Ind., 72. (C.C.)
[illegible]**ile** Gyllenhal. *Ibid.*, 78. (A.B.C.)
[illegible]**ctum** Say. Trans. Am. Ent. Soc., xxiv, 109.
[illegible]**dix** Say. Coleop. Ind., 70. (C.C.)
[illegible]**x** LeConte. *Ibid.*, 73.

guexi Chaudoir. Trans. Am. Ent. Soc., xxiv, 71. (R.Hd.)
graciliforme Hayward. Coleop. Ind., 76.
honestum Say. *Ibid.*, 72.
inæquale Say. *Ibid.*, 69. (C.C.)
nigrum Say. *Ibid.*, 73.
oberthuri Hayward. *Ibid.*, 74.
picipes Kirby. *Ibid.*, 73. (K.F.C.)
punctatostriatum Say. *Ibid.*, 70. (C.C.)
quadrimaculatum Linnæus. *Ibid.*, 78.
scopulinum Kirby. Trans. Am. Ent. Soc., xxiv, 82. (R.Hd.)
semistriatum Haldeman. Coleop. Ind., 79.
ustulatum Linnæus. *rupestre*. Trans. Am. Ent. Soc., xxiv. 80. (C.C.) (K.F.C.)
variegatum Say. Coleop. Ind., 77.
versicolor LeConte. *Ibid.*, 76. (C.C.)
sp.

Tachys Schaum.

corruscus LeConte. Coleop. Ind., 86. (A.B.C.)
flavicauda Say. *Ibid.*, 82.
incurvus Say. *Ibid.*, 82.
lævus Say. *Ibid.*, 85. (C.C.)
nanus Gyllenhal. *Ibid.*, 82.
proximus Say. Compl. Writ., 502. (K.F.C.)
scitulus LeConte. Coleop. Ind., 85. (C.C.)
xanthopus Dejean. *Ibid.*, 83.

Patrobus Dejean.

longicornis Say. Coleop. Ind., 87.
rugicollis Randall. Jour. N. Y. Ent. Soc., iii, 75.

Trechus Clairville.

chalybeus Dejean. Coleop. Ind., 87. (A.B.C.)

Myas Dejean.

coracinus Say. Coleop. Ind., 89. (G.D.)
cyanescens Dejean. *Ibid.*, 89.

Pterostichus Bonelli.

adoxus Say. Coleop. Ind., 91.
apalachius Horn. *Ibid.*, 91.
caudicalis Say. *Ibid.*, 96.
convexicollis Say. Compl. Writ., ii, 475. (C.C.)

coracinus Newman. Coleop. Ind., 93.
corusculus LeConte. Proc. Acad. Nat. Sci. Phila., 1873, 314.
corvinus Dejean. Coleop. Ind., 97.
erythropus Dejean. *Ibid.*, 99.
honestus Say. *Ibid.*, 91.
lachrymosus Newman. *Ibid.*, 93.
luctuosus Dejean. *Ibid.*, 96.
lucublandus Say. *Ibid.*, 95.
lustrans LeConte. Am. Lyc. Nat. Hist., N. Y. v, 181. (G.D.)
mancus LeConte. Jour. Acad. Nat. Sci., Phila., ii, 234. (C.C.)
mutus Say. Coleop. Ind., 98.
patruelis Dejean. *Ibid.*, 99.
pennsylvanicus LeConte. *Ibid.*, 98. (K.F.C.)
rostratus Newman. *Ibid.*, 91. (K.F.C.)
sayi Brullé. *Ibid.*, 95.
scrutator LeConte. *Ibid.*, 97.
stygicus Say. *Ibid.*, 93.
vitreüs Dejean. Jour. N. Y. Ent. Soc., iii, 188.

Amara Bonelli.

angustata Say. Coleop. Ind., 105.
apricaria Paykull. Trans. Am. Ent. Soc., xxxiv, 41.
avida Say. Coleop. Ind., 103.
basillaris Say. *Ibid.*, 106. (C.C.)
chalcea Dejean. *Ibid.*, 109.
crassispina LeConte. *Ibid.*, 107.
cupreolata Putzeys. *Ibid.*, 106.
devincta Casey. Mem. Coleop., viii, 307. (T.L.C.)
exarata Dejean. Coleop. Ind., 104.
fallax LeConte. *Ibid.*, 106. (C.C.)
latior Kirby. *Ibid.*, 106.
impuncticollis Say. *Ibid.*, 106.
musculus Say. *Ibid.*, 109.
obesa Say. *Ibid.*, 108.
pennsylvanica Hayward. *Ibid.*, 103.
rubrica Haldeman. *Ibid.*, 109.

Diplochila Brullé.

laticollis LeConte. Coleop. Ind., 113.

Dicælus Bonelli.

elongatus Bonelli. Coleop. Ind., 116.
dilatatus Say. *Ibid.*, 116. (K.F.C).
politus Dejean. *Ibid.*, 116.
purpuratus Bonelli. *Ibid.*, 115.
teter Bonelli. *Ibid.*, 116.

Badister Clairville.

micans LeConte. Coleop. Ind., 119.
pulchellus LeConte. *Ibid.*, 118.

Calathus Bonelli.

gregarius Say. Coleop. Ind., 120.
impunctatus Say. *Ibid.*, 121.
opaculus LeConte. *Ibid.*, 120.

Platynus Bonelli.

æruginosus Dejean. Coleop. Ind., 133.
affinis Kirby. *Ibid.*, 130.
anchomenoides Randall. Bost. Jour. Nat. Hist., ii, 2. (C.C.)
atratus LeConte. Coleop. Ind., 130. (C.C.)
bogemanni Gyllenhal. *Ibid.*, 133.
boopis Casey. Mem. Coleop., ix, 137.
carbo LeConte. Coleop. Ind., 128.
cincticollis Say. *Ibid.*, 125.
crenistriatus LeConte. *Ibid.*, 134.
cupripennis Say. *Ibid.*, 130.
decens Say. *Ibid.*, 124. (C.C.)
decorus Say. *Ibid.*, 126.
excavatus Dejean. *Ibid.*, 131. (A.B.C.)
extensicollis Say. *Ibid.*, 126.
ferreus Haldeman. *Ibid.*, 131.
frater LeConte. Proc. Acad. Nat. Sci. Phila., vii, 35-59. (C.C.)
lutulentus LeConte. *Ibid.*, 135.
melanarius Dejean. *Ibid.*, 130.
nutans Say. *Ibid.*, 131.
octopunctatus Fabricius. *Ibid.*, 132.
picipennis Kirby. *Ibid.*, 135.
placidus Say. *Ibid.*, 132.
punctiformis Say. Compl. Writ., ii, 481.
reflexus LeConte. Coleop. Ind., 125.
rubripes Zimmerman. *Ibid.*, 134. (A.B.C.)

ruficornis LeConte. *Ibid.*, 135.
sinuatus Dejean. *Ibid.*, 124.
tenuis LeConte. *Ibid.*, 129.

Olisthopus Dejean.

micans LeConte. Ann. Lyc. Nat. Hist. N. Y., iv, 230. (A.B.C.) (H.B.K.)
parmatus Say. Coleop. Ind., 136.

Casnonia Latreille.

pennsylvanica Linnæus. Coelop. Ind., 139.

Galerita Fabricius.

bicolor Drury. Coleop. Ind. 140.
janus Fabricius. *Ibid.*, 140.

Tetragonoderus Dejean.

fasciatus Haldeman. Coleop. Ind., 142. (C.C.)

Lebia Latreille.

analis DeGeer. Coleop. Ind., 147.
atriventris Say. *Ibid.*, 144.
furcata LeConte. *Ibid.*, 148. (G.D.)
fuscata Dejean. *Ibid.*, 147.
grandis Hentz. *Ibid.*, 144.
ornata Say. *Ibid.*, 146.
pectita Horn. Trans. Am. Ent. Soc., xii, 133.
pulchella Dejean. Coleop. Ind., 145.
pumila Dejean. *Ibid.*, 146.
scapularis Dejean. *Ibid.*, 148.
viridipennis Dejean. *Ibid.*, 146.
viridis Say. *Ibid.*, 146.
vittata Fabricius. *Ibid.*, 148.

Dromius Bonelli.

piceus Dejean. Coleop. Ind., 149.

Apristus Chaudoir.

subsulcatus Dejean. Coleop. Ind., 150.

Metabletus Schmidt.

americanus Dejean. Coleop. Ind., 151.

Axinopalpus LeConte.

biplagiatus Dejean. Coleop. Ind., 151 (A.B.C.)

Pinacodera Schaum.

limbata Dejean. Coleop. Ind. 152.
platicollis Say. *Ibid.*, 153.

Cymindis Latreille.

americana Dejean. Coleop. Ind., 153.
neglecta Haldeman. Trans. Am. Ent. Soc., x, 155.
pilosa Say. Coleop. Ind., 153.

Apenes LeConte.

lucidula Dejean. Coleop. Ind., 154.
sinuata Say. *Ibid.*, 154.

Helluomorpha Laporte.

bicolor Harris. Coleop. Ind., 155.

Brachynus Weber.

alternans Dejean. Coleop. Ind., 159. (C.C.)
ballistarius LeConte. *Ibid.*, 160.
conformis Dejean. Ann. Lyc. Nat. Hist. N. Y., iv, 207.
cordicollis Dejean. Coleop. Ind., 160.
cyanipennis Say. *Ibid.*, 161. (C.C.)
fumans Fabricius. *Ibid.*, 161.
perplexus Dejean. *Ibid.*, 161.
tormentarius LeConte. *Ibid.*, 159.

Chlænius Bonelli.

æstivus Say., Coleop. Ind., 165.
impunctifrons Say. *Ibid.*, 168.
laticollis Say. *Ibid.*, 166.
leucoscelis Chevrolat. *Ibid.*, 165. (C.C.)
nemoralis Say. *Ibid.*, 169.
pennsylvanicus Say. *Ibid.*, 168.
prasinus Dejean. *Ibid.*, 165.
purpuricollis Randall. *Ibid.*, 168. (C.C.)
sericeus Fœrster. *Ibid.*, 166.
solitarius Say. *Ibid.*, 165.
tomentosus Say. *Ibid.*, 167.
tricolor Dejean. *Ibid.*, 169.

Anomoglossus Chaudoir.

emarginatus Say. Coleop. Ind., 169.
pusillus Say. *Ibid.*, 170.

Brachylobus Chaudoir.

lithophilus Say. Coleop. Ind., 170. (C.C.)

Lachnocrepis LeConte.

parallelus Say. Coleop. Ind., 171. (H.L.J.)

Oödes Bonelli.

americanus Dejean. Coleop. Ind., 172. (A.B.C.)

Geopinus LeConte.

incrassatus Dejean. Coleop. Ind., 174.

Agonoderus Dejean.

lineola Fabricius. Coleop. Ind., 177.
pallipes Fabricius. *Ibid.*, 177.
partiarius Say. *Ibid.*, 177. (A.B.C.)
pauperculus Dejean. *Ibid.*, 177. (C.C.)
testaceus Dejean. *Ibid.*, 177.

Gynandropus Dejean.

hylacis Say. Coleop. Ind. 179.

Harpalus Latreille.

autumnalis Say. Coleop. Ind., 185.
caliginosus Fabricius. *Ibid.*, 181.
compar LeConte. *Ibid.*, 182.
convivus LeConte. *Ibid.*, 181. (C.C.)
dichrous Dejean. *Ibid.*, 184.
erraticus Say. *Ibid.*, 181.
erythropus Dejean. *Ibid.*, 183.
faunus Say. *Ibid.*, 181.
herbivagus Say. *Ibid.*, 185.
laticeps LeConte. *Ibid.*, 184.
lewisii LeConte. Proc. Acad. Nat. Sci., Phila., 1865, 103.
longior Kirby. *longicollis.* Coleop. Ind., 183.
megacephalus LeConte. Ann. Lyc. Nat. Hist. N. Y., iv, 3
nitidulus Chaudoir. Coleop. Ind., 185. (C.C.)
pennsylvanicus Dejean. *Ibid.*, 182.
pleuriticus Kirby. *Ibid.*, 184.
spadiceus Dejean. Can. Ent., ii, 61.
vagans LeConte. Coleop. Ind., 182.
viduus LeConte. *Ibid.*, 186. (C.C.)
viridiæneus Beauvois. *Ibid.*, 181.
vulpeculus Say. *Ibid.*, 184.

Selenophorus Dejean.

gagatinus Dejean. Coleop. Ind., 187.
opalinus LeConte. *Ibid.*, 187.
pedicularis Dejean. *Ibid.*, 187.

Stenolophus Dejean.

conjunctus Say. Coleop. Ind., 189.
fuliginosus Dejean. *Ibid.*, 188.
humilus Hamilton. Can. Ent., xxv, 306. (C.C.)
ochropezus Say. Coleop. Ind., 188.
plebius Dejean. *Ibid.*, 188.

Acupalpus Latreille.

carus LeConte. Coleop. Ind., 190. (A.B.C.)
hydropicus LeConte. *Ibid.*, 190. (A.B.C.)

Bradycellus Erichson.

rupestris Say. Coleop. Ind., 192.

Tachycellus Morawitz.

badiipennis Haldeman. Coleop. Ind., 193. (A.B.C.)
kirbyi Horn. *Ibid.*, 193. (A.B.C.)
nigrinus Dejean. *Ibid.*, 192. (A.B.C.)

Anisodactylis Dejean.

baltimorensis Say. Coleop. Ind.; 197.
carbonarius Say. *Ibid.*, 195.
discoideus Dejean. *Ibid.*, 197.
harrisii LeConte. *Ibid.*, 196.
interpunctatus Kirby. *Ibid.*, 196.
interstitialis Say. *Ibid.*, 200.
lugubris Dejean. *Ibid.*, 199.
melanopus Haldeman. *Ibid.*, 197.
nigerrimus Dejean. *Ibid.*, 196.
nigrita Dejean. *Ibid.*, 197. (C.C.)
nitidipennis LeConte. *Ibid.*, 199.
rusticus Say. *Ibid.*, 194.
sericeus Harris. *Ibid.*, 200.
terminatus Say. *Ibid.*, 199.
verticalis LeConte. *Ibid.*, 198.

Family OMOPHRONIDÆ.

Omophron Latreille.

americanum Dejean. Coleop. Ind., 40.
labiatum Fabricius. *Ibid.*, 40. (K.F.C.)
tessellatum Say. *Ibid.*, 41.

Family HALIPLIDÆ.

Haliplus Latreille.

connexus Matheson. Jour. N. Y. Ent. Soc., xx, 164. (K.F.C.)
cribrarius LeConte. *Ibid.*, xx, 170. (K.F.C.)
fasciatus Aubé. Coleop. Ind., 202. (C.C.)
leopardus Roberts. Jour. N. Y. Ent. Soc., xxi, 98. (K.F.C.)
ruficollis DeGeer. Coleop. Ind., 203. (C.C.)
triopsis Say. *punctatus*. *Ibid.*, 202.

Peltodytes Regimbart.

Cnemidotus Illiger.

duodecimpunctatus Say. *12-punctatus*. Coleop. Ind., 204.
edentulus LeConte. *Ibid.*, 204. (K.F.C.)
muticus LeConte. *Ibid.*, 204. (K.F.C.)
shermani Roberts. Jour. N. Y. Ent. Soc., xxi, 116. (K.F.C.)

Family DYTISCIDÆ.

Hydrocanthus Say.

iricolor Say. Coleop. Ind., 208. (C.C.)

Laccophilus Leach.

maculosus Germar. Coleop. Ind., 209.
undatus Aubé. *Ibid.*, 210. (F.K.)

Desmopachria Babington.

convexa Aubé. Coleop. Ind., 212.

Bidessus Sharp.

affinis Say. Coleop. Ind., 213.
granarius Aubé. *Hydroporus*. Trans. Am. Ent. Soc., iv, 390.

Celina Aubé.

angustata Aubé. Coleop. Ind., 214.

Cœlambus Thomson.

dispar LeConte. *dissimilis*. Coleop. Ind., 215. (G.D.)
inæqualis Fabricius. *puntatus* Say. *Ibid.*, 215.

Deronectes Sharp.*

catascopium Say. Coleop. Ind., 216. (G.D.)

Hydroporus Clairville.*

americanus Aubé. Coleop. Ind., 220. (C.C.)
dimidiatus LeConte. *semirufus*. *Ibid.*, 219.

* See also appendix.

niger Say. *modestus. Ibid.*, 220.
pulcher LeConte. *Ibid.*, 218.
signatus Mannerheim. Bull. Moscow, 1853, 161.
solitarius Sharp. On Dytiscidæ, 443.
stagnalis Gemminger and Harold. Coleop. Ind., 218.
tenebrosus LeConte. *Ibid.*, 217.
undulatus Say. *Ibid.*, 219. (C.C.)
vitiosus Sharp. *blanchardi.* On Dytiscidæ, 443.

Ilybius Erichson.

biguttulus Germar. Coleop. Ind., 222.
confusus Aubé. *Ibid.*, 222. (A.B.C.)
subæneus Erichson. *Ibid.*, 222. (K.F.C.)

Coptotomus Say.

interrogatus Fabricius. Coleop. Ind., 223.

Copelatus Erichson.

glyphicus Say. Coleop. Ind., 223.

Matus Aubé.

bicarinatus Say. Coleop. Ind., 223.

Agabetes Crotch.

acuductus Harris. Coleop. Ind., 224. (C.C.)

Agabus Leach.

æruginosus Aubé. Species Gén., vi, 298. (C.C.)
disintegratus Crotch. Coleop. Ind., 227.
erythropterus Say. *Ibid.*, 226. (A.B.C.)
gagates Aubé. *Ibid.*, 226.
obtusatus Say. *Ibid.*, 226. (A.B.C.)
punctatus Melsheimer. *Ibid.*, 226.
reticulatus Aubé. *Ibid.*, 225. (K.F.C.)
semipunctatus Kirby. *Ibid.*, 227.
seriatus Say. *parallelus. Ibid.*, 226.
stagninus Say. *Ibid.*, 226.

Rhantus Eschscholtz.

binotatus Harris. Coleop. Ind., 228.
bistriatus Bergstrasser. *Ibid.*, 228. (C.C.)

Colymbetes Clairville.

sculptilis Harris. Coleop. Ind., 229.

Dytiscus Linnæus.

fasciventris Say. Coleop. Ind., 231.
harrisii Kirby. *Ibid.*, 231.
hybridus Aubé. *Ibid.*, 231. (C.C.)
verticalis Say. *Ibid.*, 231.

Hydaticus Leach.

piceus LeConte. Coleop. Ind., 232.
stagnalis Fabricius. *Ibid.*, 232.

Acilius Leach.

fraternus Harris. Coleop. Ind., 234.
mediatus Say. *Ibid.*, 233.
semisulcatus Aubé. *Ibid.*, 233.

Thermonectes Eschscholtz.

ornaticollis Aubé. Coleop. Ind., 234. (C.C.)

Graphoderes Eschscholtz.

fasciatocollis Harris. *cinereus*. Coleop. Ind., 235.
liberus Say. *Ibid.*, 235. (C.C.)

Family GYRINIDÆ.

Gyrinus Linnæus.

borealis Aubé. Coleop. Ind., 240.
limbatus Say. *Ibid.*, 239.
lugens LeConte. *Ibid.*, 240.
ventralis Kirby. *Ibid.*, 239.
sp.

Dineutes MacLeay.

assimilis Aubé. Coleop. Ind., 242.
discolor Aubé. *Ibid.*, 241.
emarginatus Say. *Ibid.*, 241. (H.L.J.)
hornii Roberts. *Ibid.*, 242.
nigrior Roberts. Trans. Am. Ent. Soc., xxii, 284.
vittatus Germar. Coleop. Ind., 241.

Family HYDROPHILIDÆ.

Hydræna Kugelan.

pennsylvanica Kiesenwetter. Coleop. Ind., 254. (C.C.)

Helophorus Fabricius.

lineatus Say. Coleop. Ind., 251.

Hydrochus Leach.

scabratus Mulsant. Coleop. Ind., 251.

subcupreus Randall. *Ibid.*, 252. (C. C.)

Berosus Leach.

infuscatus LeConte. Can. Ent., xxvii, 185. (C.C.)

peregrinus Herbst. Coleop. Ind., 258.

striatus Say. *Ibid.*, 259.

Hydrous Dahl.

ovalis Ziegler. Coleop. Ind., 255.

triangularis Say. *Ibid.*, 255.

Hydrophilus DeGeer.

obtusatus Say. Coleop. Ind., 257.

Tropisternus Solier.

glaber Herbst. Coleop. Ind., 256. (K.F.C.)

mixtus LeConte. *Hydrophilus. Ibid.*, 256.

nimbatus Say. *Ibid.*, 256.

Hydrobius Leach.*

fuscipes Linnæus. Coleop. Ind., 262.

globosus Say. *Ibid.*, 263.

Paracymus Thomson.

Creniphilus Motschulsky.

despectus LeConte. Coleop. Ind., 264.

digestus LeConte. Trans. Am. Ent. Soc., xvii. 274.

infuscatus Motschulsky. Coleop. Ind., 264.

subcupreus Say. *Ibid.*, 264.

Enochrus Thomson.

Philhydrus Solier.

cinctus Say. Coleop. Ind., 261.

hamiltoni Horn. *Ibid.*, 260.

ochraceus Melsheimer. *Ibid.*, 260.

perplexus LeConte. *Ibid.*, 261.

reflexipennis Zimmerman. *angustulus* Casey. Trans. Am. Ent. Soc., xvii., 250.

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* See also appendix.

Laccobius Erichson.

agilis Randall. Coleop. Ind., 259.

Cymbiodyta Bedel.

fimbriata Melsheimer. Trans. Am. Ent. Soc., xvii., 258: Coleop. Ind., 262.
lacustris LeConte. Coleop. Ind., 262.

Chætarthria Stephens.

atra LeConte. Proc. Acad. Nat. Sci. Phila., vi, 24.

Cercyon Leach.

analis Paykull. Coleop. Ind., 269.
depressus Stephens. Trans. Am. Ent., Soc., vii, 293. (C.C.)
hæmorrhoidalis Fabricius. Coleop. Ind., 267.
indistinctus Horn. *Ibid.*, 267.
lateralis Marsham. Trans. Am. Ent. Soc., xvii, 297.
littoralis Gyllenhal. *Ibid.*, 291.
navicularis Zimmerman. Coleop. Ind., 269. (C.C.)
ocellatus Say. *Ibid.*, 269. (C.C.)
prætextatus Say. *Ibid.*, 268.
pygmæus Illiger. *Ibid.*, 268.
unpunctatus Linnæus. *Ibid.*, 268.

Sphæridium Fabricius.

bipustulatus Fabricius. Jour. N. Y. Ent. Soc., xx, 69.
scarabæoides Linnæus. Coleop. Ind., 265.

Cryptopleurum Mulsant.

minutum Fabricius. Coleop. Ind., 270.

Family SILPHIDÆ.

Necrophorus Fabricius.

americanus Olivier. Coleop. Ind., 274.
marginatus Fabricius. *Ibid.*, 275.
orbicollis Say. *Ibid.*, 275.
pustulatus Herschel. *Ibid.*, 275.
sayi Laporte. *Ibid.*, 274.
tomentosus Weber. *Ibid.*, 274.
vespilloides Herbst. Trans. Am. Ent. Soc., viii, 234.

Silpha Linnæus.

ericana Linnæus. Coleop. Ind., 277.
:qualis Fabricius. *Ibid.*, 276.
'eboracensis Fœrster. *Ibid.*, 277.
inamensis Herbst. *Ibid.*, 276.

Choleva Latreille.

ricornis LeConte. Coleop. Ind., 280.
ninans LeConte. *Ibid.*, 280. (C.C.)

Prionochæta Horn.

ıca Say. Coleop. Ind., 280.

Ptomophagus Illiger.

ısobrinus LeConte. Coleop. Ind., 281. (C.C.)
asitus LeConte. *Ibid.*, 282.
ıio LeConte. *Ibid.*, 282. (C.C.)

Colon Herbst.

entatum Sahlberg. Trans. Am. Ent. Soc., viii, 269. (C.C.)

Anisotoma Illiger.

:rnata Melsheimer. Trans. Am. Ent. Soc., viii, 285.

Leiodes Latreille.

color Melsheimer. Coleop. Ind., 287. (C.C.)
bosa LeConte. *Ibid.*, 287. (C.C.)

Agathidium Illiger.

guum Melsheimer. Coleop. Ind., 290.
scoides Beauvois. *Ibid.*, 290.

Family SCYDMÆNIDÆ.

Euconnus Thomson.

olor LeConte. Ann. N. Y. Acad. Sci., ix, 370.
inator LeConte. Coleop. Ind., 295. (C.C.)

Connophron Casey.

siger LeConte. Coleop. Ind., 298. (C.C.)
tellus LeConte. Ann. N. Y. Acad. Sci., ix, 429.
unosum Casey. *Ibid.*, ix, 459. (C.C.)
ophilum Casey. *Ibid.*, ix, 405.

Scydmænus Latreille.

foratus Schaum. Coleop. Ind., 301. (C.C.)

Family CORYLOPHIDÆ.

Sericoderus Stephens.

flavidus LeConte. Coleop. Ind., 504.

Molamba Casey.

fasciata Say. *Sacium*. Coleop. Ind., 505. (C.C.)
lunata LeConte. *Sacium*. *Ibid.*, 505. (C.C.)

Rhypobius LeConte.

marinus LeConte. Jour. N. Y. Ent. Soc., viii, 65. (C.W.L.)

Family STAPHYLINIDÆ.

Thoracophorus Motschulsky.

Glyptoma Erichson.

costale Erichson. Coleop. Ind., 484.

Triga Fauvel.

picipennis LeConte. Coleop. Ind., 484.

Olisthærus Heer.

nitidus LeConte. Trans. Am. Ent. Soc., v, 50.

Anthobium Leach.

convexum Fauvel. Coleop. Ind., 481.

Olophrum Erichson.

obtectum Erichson. Coleop. Ind., 479.

Oxytelus Gravenhorst.

insignitus Gravenhorst. Coleop. Ind., 468.
sculptus Gravenhorst. *Ibid.*, 468.

Homalium Gravenhorst.

rivulare Paykull. Coleop. Neerland., i, 359.

Platystethus Mannerheim.

americanus Erichson. Coleop. Ind., 467.

Bledius Leach.

pallipennis Say. *mandibularis*. Coleop. Ind., 464.

Stenus Latreille.

colonus Erichson. Coleop. Ind., 408.
ingratus Casey. *Ibid.*, 406.
morio Gravenhorst. *subgriseus* Casey. *Ibid.*, 411.
stygicus Say. Coleop. Ind., 409.

Areus Casey.

annularis Erichson. *Stenus*. Coleop. Ind., 413.
arculus Erichson. *Stenus*. *Ibid.*, 414.
cribratum LeConte. Smith Misc. Coll., 1865, 46.
flavicornis Erichson. *Stenus*. Coleop. Ind., 413.

Hesperobium Casey.

pallipes Gravenhorst. *flavicorne*. Can. Ent., xvii, 180.

Lathrotaxis Casey.

longiusculum Gravenhorst. *Lathrobium*. Coleop. Ind., 427.

Gasterolobium Casey.

bicolor Gravenhorst. *Cryptobium*. Coleop. Ind., 418.

Pæderus Gravenhorst.

littorarius Gravenhorst. Coleop. Ind., 437.

Lathrobium Gravenhorst.

simile LeConte. Coleop. Ind., 424.
simplex LeConte. *Ibid.*, 423.

Trachysectus Casey.

confluentus Say. *Lithocharis*. Coleop. Ind., 431.

Astenus Stephens.

Sunius Erichson.

discopunctatus Say. *longiusculus*. Coleop. Ind., 439.

Gyrohypnus Mannerheim.

Xantholinus Serville.

emmesus Gravenhorst. Coleop. Ind., 396.
hamatus Say. *obscurus*. *Ibid.*, 396.
obsidianus Melsheimer. *Ibid.*, 395.
pusillus Sachse. *Ibid.*, 398.
sanguinipennis LeConte. Trans. Am. Ent. Soc., viii, 174.

Nudobius Thomson.

cephalus Say. *Xantholinus*. Coleop. Ind., 395.

Neobisnius Ganglbauer.

pæderoides LeConte. Coleop. Ind., 393.

Philonthus Curtis.

blandus Gravenhorst. Coleop. Ind., 387.
brunneus Gravenhorst. *Ibid.*, 386.
cyanipennis Fabricius. *Ibid.*, 387.

debilis Gravenhorst. *Ibid.*, 383.
fusiformis Melsheimer. *Ibid.*, 385.
lomatus Erichson. *Ibid.*, 386.
longicornis Stephens. *Ibid.*, 383.
microphthalmus Horn. *Ibid.*, 388.
politus Linnæus. *æneus* Rossi. Trans. Am. Ent. Soc., xi, 181.
schwarzi Horn. *Ibid.*, 385.
sp.

Ocypus Kirby.

ater Gravenhorst. Coleop. Ind., 379.

Staphylinus Linnæus.

badipes LeConte. Coleop. Ind., 376.
cinnamopterus Gravenhorst. *Ibid.*, 377.
fossator Gravenhorst. *Ibid.*, 377.
maculosus Gravenhorst. *Ibid.*, 377.
mysticus Erichson. *Ibid.*, 377.
prælongus Mannerheim. Trans. Am. Ent. Soc., vii, 197. (A.B.C.)
violaceus Gravenhorst. Coleop. Ind., 378.
vulpinus Nordmann. *Ibid.*, 376.

Ortholestes Ganglbauer.

Listotrophus Perty.

capitatus Bland. Proc. Phila. Ent. Soc., iii, 65. (K.F.C.)
cingulatus Gravenhorst. Coleop. Ind., 374.

Creophilus Mannerheim.

villosus Gravenhorst. Coleop. Ind., 374.

Acylophorus Nordmann.

pronus Erichson. Coleop. Ind., 368.

Quedius Stephens.

vernix LeConte. Coleop. Ind., 373.

Oxyporus Fabricius.

lateralis Gravenhorst. Coleop. Ind., 461.
major Gravenhorst. *Ibid.*, 459. (A.B.C.) (H.B.K.)
vittatus Gravenhorst. *Ibid.*, 460.

Habrocerus Erichson.

schwarzii Horn. Coleop. Ind., 457.

Tachinus Gravenhorst.

fimbriatus Gravenhorst. Coleop. Ind., 446.
fumipennis Say. Trans. Am. Ent. Soc., vi, 100.
limbatus Melsheimer. Coleop. Ind., 446.

Tachyporus Gravenhorst.

chrysomelinus Linnæus. Coleop. Ind., 448.
jocosus Say. *Ibid.*, 448.
maculipennis LeConte. *Ibid.*, 447.

Erchomus Motschulsky.

ventriculus Say. Coleop. Ind., 449.

Conosoma Kraatz.

basale Erichson. Coleop. Ind., 451.
crassum Gravenhorst. *Ibid.*, 450.
pubescens Paykull. *Ibid.*, 451.

Boletobius Stephens.

cincticollis Say. Coleop. Ind., 453.
cinctus Gravenhorst. *Ibid.*, 454.
intrusus Horn. *Ibid.*, 454.
niger Gravenhorst. *Ibid.* 452.
trinotatus Erichson. *Ibid.*, 454.

Bryoporus Kraatz.

rufescens LeConte. Coleop. Ind., 457.

Hoplandria Kraatz.

brittoni Casey. Mem. Coleop., ii, 161.

Meronea Sharp.

venustula Erichson. Coleop. Ind., 349.

Atheta Thomson.

irvingi Casey. Mem. Coleop., i, 5.
vierecki Casey. *Ibid.*, ii, 103. (H.L.V.)

Datomicra Casey.

mina Casey. Mem. Coleop., ii, 145. (H.L.V.)

Sableta Casey.

brittoni Casey. Mem. Coleop., ii, 145. (W.E.B.)

Strigota Casey.

recta Casey. Mem. Coleop., ii, 165. (H.L.V.)

Falagria Mannerheim.

dissecta Erichson. Coleop. Ind., 347.

Gyrophæna Mannerheim.

dissimilis Erichson. Coleop. Ind., 341.
lobata Casey. *Ibid.*, 341.

Xenodusa Wasmann.

cava LeConte. *Lomechusa.* Coleop. Ind., 359.
cava var. **major** Wasmann. Deutsche Ent. Zeit., 1899, 410. (C.W.L.)

Aleochara Gravenhorst.

bimaculata Gravenhorst. Coleop. Ind., 365.
lata Gravenhorst. *Ibid.*, 364.
marion Gravenhorst. Ent. News., xix, 64.

Homœusa Kraatz.

crinitula Casey. Jour. N. Y. Ent. Soc., xviii, 54.

Haploglossa Kraatz.

sp.

Family PSELAPHIDÆ.

Batrisodes Reitter.

fossicauda Casey. Ann. N. Y. Acad. Sci., ix, 575. (C.C.)
globosus LeConte. Coleop. Ind., 326.
harringtoni Casey. Ann. N. Y. Acad. Sci., ix, 578. (C.C.)
nigricans LeConte. Coleop. Ind., 328. (C.C.)

Nisaxis Casey.

tomentosa Aubé. Coleop. Ind., 317.

Brachygluta Thomson.
Bryaxis Aubé

abdominalis Aubé. Coleop. Ind., 318. (A.B.C.)
terbrata Casey. *perforata. Ibid.*, 318. (C.C.)

Reichenbachia Leach.

puncticollis LeConte. Coleop. Ind., 322. (C.C.)
rubicunda Aubé. *Ibid.*, 321.

Decarthron Brendel.

abnorme LeConte. Coleop. Ind., 317. (C.C.)
longulum LeConte. *Ibid.*, 316. (C.C.)
stigmosum Brendel. Proc. Phila. Ent. Soc., vi, 35.

Pselaphus Herbst.

bellax Casey. Coleop. Ind., 314. (A.B.C.)

Tyrus Aubé.

humeralis Aubé. Coleop. Ind., 313.

Pilopius Casey.

Ctenistes Reichenbach.

lacustris Casey. *piceus* LeConte. Coleop. Ind., 311. (C.C.)

Ceophyllus LeConte.

monilis LeConte. Coleop. Ind., 309. (C.W.L.)

Family CLAVIGERIDÆ.

Adranes LeConte.

lecontei Brendel. Coleop. Ind., 307. (C.C.)

Family PTILIDÆ.

Trichopteryx Kirby.

haldemani LeConte. Coleop. Ind., 489. (C.W.L.)

Family SCAPHIDIIDÆ.

Scaphidium Olivier.

quadriguttatum Say. Coleop. Ind., 492. (C.C.)
quadriguttatum var. **piceum** Melsheimer. *Ibid.*, 492.

Bæocera Erichson.

sp.

Scaphisoma Leach.

convexa Say. Coleop. Ind., 496. (C.C.)
suturalis LeConte. *Ibid.*, 496. (C.C.)

Family HISTERIDÆ.

Hololepta Paykull.

fossularis Say. Coleop. Ind., 601.

Hister Linnæus.

abbreviatus Fabricius. Coleop. Ind., 607.
americanus Paykull. *Ibid.*, 609.
arcuatus Say. Compl. Writ., ii, 262. (C.C.)
bimaculatus Linnæus. Coleop. Ind., 609.
biplagiatus LeConte. *Ibid.*, 603.
cognatus LeConte. *Ibid.*, 604.
depurator Say. *Ibid.*, 607.
egregius Casey. Mem. Coleop., vii, 288.
fœdatus LeConte. Coleop. Ind., 606.
furtivus LeConte. *Ibid.*, 608.
immunis Erichson. *Ibid.*, 605.
interruptus Beauvois. *Ibid.*, 605.
lecontei Latreille. *Ibid.*, 612.
merdarius Hoffman. *Ibid.*, 612.
parallelus Say. *Ibid.*, 612.
perplexus LeConte. *Ibid.*, 609. (C.C.)
sedecimstriatus Say. *Ibid.*, 609.
stygicus LeConte. *Ibid.*, 606.

Phelister Marseul.

subrotundus Say. *Hister*. Coleop. Ind., 611.

Gnathoncus Duval.

communis Marseul. *rotundatus*. Coleop. Ind., 619.

Psiloscelis Marseul.

harrisii LeContė. *planipes*. Mem. Coleop., vii, 204. (C.C.)
perpunctatus LeConte. Trans. Am. Ent. Soc., viii, 190.

Platysoma Leach.

carolinus Paykull. Coleop. Ind., 612.
coartatus LeConte. *Ibid.*, 613. (A.B.C.) (H.B.K.)

Hetærius Erichson.

blanchardi LeConte. Proc. Am. Phil. Soc., xvii, 609. (C.C.)
brunneipennis Randall. Coleop. Ind., 615.

Dendrophilus Leach.

punctulatus Say. Coleop. Ind., 615.

Paromalus Erichson.

bistriatus Erichson. Coleop. Ind., 616.

Saprinus Erichson.

assimilis Paykull. Coleop. Ind., 620.
conformis LeConte. *Ibid.*, 620.
dimidiatipennis LeConte. *Ibid.*, 608.
fraternus Say. *Ibid.*, 623. (K.F.C.)
neglectus Marseul. Trans. Am. Phil. Soc., xiii, 335. (C.C.)
oregonensis LeConte var. **distinguendis** Marseul. Mon. Hister., 441.
patruelis LeConte. Coleop. Ind., 624.
pennsylvanicus Paykull. Coleop. Ind., 620.
posthumus Marseul. *Ibid.*, 619.

Plegaderus Erichson.

transversus Say. Coleop. Ind., 625. (C.C.)

Acritus LeConte.

politus LeConte. Coleop. Ind., 627. (C.C.)

Family LYCIDÆ.

Lycostomus Motschulsky.

lateralis Melsheimer. Coleop. Ind., 810.

Calopteron Guérin-Méneville.

reticulatum Fabricius. Coleop. Ind., 811.
terminale Say. *Ibid.*, 810.

Cæniella Cockerell.

Cænia Newman.

dimidiata Fabricius. Coleop. Ind., 811.

Celetes Newman.

basalis LeConte. Coleop. Ind., 811.

Lopheros LeConte.

fraternus Randall. Coleop. Ind., 811.

Eros Newman.

aurora Herbst. Coleop. Ind., 812.
trilineatus Melsheimer. *Ibid.*, 813.

Plateros Bourgeois.

canaliculatus Say. Coleop. Ind., 815.
modestus Say. *Ibid.*, 814.

Family LAMPYRIDÆ.

Lucidota Laporte.

atra Fabricius. Coleop. Ind., 817.
corrusca Linnæus. *Ellychnia. Ibid.*, 818.
decipiens Harris. *Pyropyga. Ibid.*, 819.
fenestralis Melsheimer. *Pyropyga. Ibid.*, 819.
nigricans Say. *Ibid.*, 819.

Lecontea Olivier.

augulata Say. *Pyractonema.* Coleop. Ind., 820.
lucifera Melsheimer. *Pyractonema.* Coleop. Ind., 821.

Photinus Laporte.*

scintillans Say. Coleop. Ind., 823. (H.L.J.)

Photuris LeConte.

pennsylvanica DeGeer. Common firefly. Coleop. Ind., 823.

Family TELEPHORIDÆ.

Omethes LeConte.

marginatus LeConte. Coleop. Ind., 825. (C.C.)

Chauliognathus Hentz.

pennsylvanicus DeGeer. Soldier beetle. Coleop. Ind., 827.

Podabrus Fischer.

basillaris Say. Coleop. Ind., 830.
frater LeConte. *Ibid.*, 830.
modestus Say. *Ibid.*, 830.
modestus var. **flavicollis** LeConte. *Ibid.*, 831.
protensus LeConte. *Ibid.*, 831. (C.C.)
rugulosus LeConte. *Ibid.*, 830.
tricostatus Say. *Ibid.*, 829.

Telephorus Schæffer.

bilineatus Say. Coleop. Ind., 835.
carolinus Fabricius. *Ibid.*, 833.
collaris LeConte. Proc. Acad. Nat. Sci., Phila., v. 540.
dentiger LeConte. Coleop. Ind., 833.
excavatus LeConte. *Ibid.*, 833.
fraxini Say. Compl. Writ., ii, 118.

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* See also appendix.

lineola Fabricius. Coleop. Ind., 834.
nigritulus? LeConte. Trans. Am. Ent. Soc., ix, 52.
rectus Walsh. Coleop. Ind., 834.
rotundicollis Say. *Ibid.*, 835.
scitulus Say. *Ibid.*, 834.
tuberculatus LeConte. *Ibid.*, 835.

Polemius LeConte.

laticornis Say. Coleop. Ind., 836.

Ditemnus LeConte.

bidentatus Say. Coleop. Ind., 837.

Trypherus LeConte.

latipennis Germar. Coleop. Ind., 838.

Malthodes Kiesenwetter.

concavus LeConte. Coleop. Ind., 839.

Family PHENGODIDÆ.

Phengodes Illiger.

sp.

Family MELYRIDÆ (MALACHIDÆ).

Collops Erichson.

nigriceps Say. *eximius.* Trans. Am. Ent. Soc., iii, 80.
quadrimaculatus Fabricius. Coleop. Ind., 841.
tricolor Say. *Ibid.*, 841.
vittatus Say. Trans. Am. Ent. Soc., iii, 81.

Malachius Fabricius.

æneus Linnæus. Trans. Am. Ent. Soc., iv, 113.

Anthocomus Erichson.

erichsoni LeConte. Coleop. Ind., 842. (C.C.)

Pseudebæus Horn.

oblitus LeConte. Coleop. Ind., 842.

Attalus Erichson.

morulus LeConte. Coleop. Ind., 844.
otiosus Say. *Ibid.*, 845. (C.C.)
pallifrons Motschulsky. *Ibid.*, 844. (C.C.)
scincetus Say. *Ibid.*, 846.
terminalis Erichson. *Ibid.*, 844.

Family CLERIDÆ.

Monophylla Spinola.

terminatus Say. *Elasmocerus.* Coleop. Ind., 849. (E.P.F.)

Cymatodera Gray.

bicolor Say. Coleop. Ind., 850. (D.J.C.)
inornata Say. *Ibid.*, 850.

Thanasimus Latreille.

dubius Say. Coleop. Ind., 854.

Enoclerus Gahan.

analis LeConte. Coleop. Ind., 853. (F.K.)
nigrifrons Say. *Ibid.*, 853.
quadriguttatus Olivier. *nigripes. Ibid.*, 853.
rosmarus Say. *Ibid.*, 854.

Phlœopterus Wolcott.

thoracicus Olivier. *Enoclerus.* Coleop. Ind., 854.

Trichodes Herbst.

nuttalli Kirby. Coleop. Ind., 852.

Hydnocera Newman.

humeralis Say. Coletop. Ind., 856.
humeralis var. **difficilis** LeConte. *Ibid.*, 856.
pallipennis Say. *Ibid.*, 856.
tabida LeConte. *Ibid.*, 857. (A.B.C.)
unifasciata Say. *Ibid.*, 855.
verticalis Say. *Ibid.*, 857.

Zenodosus Wolcott.

sanguineus Say. Coleop. Ind., 855.

Phyllobænus Spinola.

dislocatus Say. Coleop. Ind., 858. (A.B.C.)

Neichnea Wolcott and Chapin.

laticornis Say. *Ichnea. Ellipotoma.* Coleop. Ind., 859.

Chariessa Perty.

pilosa Fœrster. Coleop. Ind., 859.

Corinthiscus Fairmaire.

Pelonium Spinola.

leucophæum Klug. *Cregya vestusta* Spinola. Coleop. Ind., 860.

Necrobia Latreille.

ruficollis Fabricius. Coleop. Ind., 861.
rufipes DeGeer. *Ibid.*, 861.
violacea Linnæus. *Ibid.*, 862.

Family LYMEXYLIDÆ.

Hylecœtus Latreille.

lugubris Say. Coleop. Ind., 894. (A.B.C.)

Melittomma Murray.

sericeum Harris. *Lymexylon.* Chestnut timber beetle. Coleop. Ind., 895.

Family CEPHALOIDÆ.

Cephaloön Newman.

lepturides Newman. Ann. N. Y. Acad. Sci., ix, 650.

Family ŒDEMERIDÆ.

Nacerdes Schmidt.

melanura Linnæus. Coleop. Ind., 1306.

Asclera Schmidt.

ruficollis Say. Coleop. Ind., 1307.

Family MORDELLIDÆ.

Anaspis Geoffroy.

flavipennis Haldeman. Coleop. Ind., 1310.
rufa Say. *Ibid.*, 1310.

Tomoxia Costa.

bidentata Say. Coleop. Ind., 1311.

Mordella Linnæus.

marginata Melsheimer. Coleop. Ind., 1313.
melæna Germar. *Ibid.*, 1312.
oculata Say. *Ibid.*, 1314.
scutellaris Fabricius. *Ibid.*, 1313.
triloba Say. *Ibid.*, 1314. (F.K.)

Glipodes LeConte.

helva LeConte. Proc. Acad. Nat. Sci., Phila., xiv, 48.

Mordellistena Costa.

aspersa Melsheimer. Coleop. Ind., 1319.
comata LeConte. *Ibid.*, 1319.
comata var. **cervicalis** LeConte. *Ibid.*, 1319.
grammica LeConte var. **varians** LeConte. *Ibid.*, 1321. (F.K.)
pubescens Fabricius. *Ibid.*, 1335.

Family RHIPIPHORIDÆ.

Rhipiphorus Bosc d'Antic.

fasciatus Say. *Myodites. walshii.* Coleop. Ind., 1367.

Macrosiagon. Hentz.

flavipennis LeConte. *Rhipiphorus.* Coleop. Ind., 1366.
limbatum Fabricius. *Ibid.*, 1367.

Family MELOIDÆ (or CANTHARIDÆ.)

Epicauta Redtenbacher.

cinerea Fœrster. Coleop. Ind, 1362.
cinerea var. **marginata** Fabricius. *Ibid.*, 1362.
pennsylvanica DeGeer. *Ibid.*, 1362.
vittata Fabricius. *Ibid.*, 1361.

Macrobasis LeConte.

unicolor Kirby. Coleop. Ind., 1359.

Pomphopæa LeConte.

ænea Say. Coleop. Ind., 1364.
sayi LeConte. *Ibid.*, 1364.
unguicularis LeConte. *Ibid.*, 1364.

Meloe Linnæus.

angusticollis Say. Coleop. Ind., 1353.

Zonitis Fabricius.

bilineata Say. Coleop. Ind., 1356.

Tricrania LeConte.

sanguinipennis Say. Coleop. Ind., 1354.

Family PYTHIDÆ.

Pytho Latreille.

niger Kirby. Trans. Am. Ent. Soc., xv, 46.
planus Herbst. *americanus* Kirby. Ins. Aff. Park and Woo Trees, 368: Trans. Am. Ent. Soc., xv, 46.

Rhinosimus Latreille.

viridiæneus Randall. Coleop. Ind., 1304.

Family PYROCHROIDÆ.

Pyrochroa Geoffroy.

femoralis LeConte. Coleop. Ind., 1348.
flabellata Fabricius. *Ibid.*, 1348.

Schizotus Newman.

cervicalis Newman. Coleop. Ind., 1349.

Dendroides Latreille.

bicolor Newman. *canadensis*. Coleop. Ind., 1349. (G.D.)
concolor Newman. *Ibid.*, 1349.

Family PEDILIDÆ.

Pedilus Fischer.
Corphyra Say.

collaris Say. Coleop. Ind., 1331.
elegans Hentz. *Ibid.*, 1330.
lugubris Say. *Ibid.*, 1331.

Macratria Newman.

confusa LeConte. Coleop. Ind., 1332.

Family ANTHICIDÆ.

Notoxus Geoffroy.

anchora Hentz. Coleop. Ind., 1335.
bifasciatus LeConte. *Ibid.*, 1335.
mondon Fabricius. *Ibid.*, 1336.

Malporus Casey.

formicarius Laferté. Coleop. Ind., 1338. (A.B.C.) (H.B.K.)

Thicanus Casey.

rejectus LeConte. Ann. N. Y. Acad. Sci., viii, 671. (A.B.C.) (H.B.K.)

Lappus Casey.

sturni Laferté. *elegans*. Ann. N. Y. Acad. Sci., viii, 657. (G.D.)

Hemantus Casey.

floralis Linnæus. Ann. N. Y. Acad. Sci., viii, 683.

Anthicus Paykull.

cervinus Laferté. Coleop. Ind., 1341.

Sapintus Casey.

pubescens LeConte. Ann. N. Y. Acad. Sci., viii, 733.

Family ELATERIDÆ.

Tharops Castner.

ruficornis Say. Coleop. Ind., 703.

Adelocera Latreille.

discoidea Weber. Coleop. Ind., 715.
marmorata Fabricius. *Ibid.*, 714.
obtecta Say. *Ibid.*, 715.

Alaus Eschscholtz.

oculatus Linnæus. Eyed elater or click-beetle. Coleop. Ind., 717.

Monocrepidius Eschscholtz.

auritus Herbst. Coleop. Ind., 728.
bella Say. *Ibid.*, 728.
vespertinus Fabricius. *Ibid.*, 728.

Campylus Fischer.

denticornis Kirby. Coleop. Ind., 759.

Limonius Eschscholtz.

basillaris Say. Coleop. Ind., 758. (C.C.)
confusus LeConte. *Ibid.*, 758.
ectypus Say. *agonus*. *Ibid.*, 756.
griseus Beauvois. *Ibid.*, 757.
nimbatus Say. Ann. Lyc. Nat. Hist. N. Y., i, 255. (C.C.)
plebejus Say. Coleop. Ind., 758.
quercinus Say. *Ibid.*, 758.
stigma Herbst. Kafer, x, 286. (A.B.C.)

Leptoschema Horn.

discalceatum Say. Coleop. Ind., 761.

Athous Eschscholtz.

acanthus Say. Coleop. Ind., 760. (C.C.)
brightwelli Kirby. *Ibid.*, 759.
cucullatus Say. *Ibid.*, 870.

Ludius Eschscholtz.

Corymbites Latreille.

æripennis Kirby. Trans. Am. Phil. Soc., x, 439.
æthiops Herbst. Coleop. Ind., 766.
cylindriformis Herbst. *Ibid.*, 765.
hieroglyphicus Say. *Ibid.*, 766.
inflatus Say. *Ibid.*, 767.

nigricornis Panzer. *metallicus*. Faun. Germ., lxi, 5.
pyrrhos Herbst. Coleop. Ind., 767.
splendens Ziegler. *Ibid.*, 768.
sulcicollis Say. *Ibid.*, 768. (C.C.)
tarsalis Melsheimer. *Ibid.*, 765.
tessellatus Linnæus. Syst. Nat., (Ed. 10) 406.
triundulatus Randall. Trans. Am. Phil. Soc., x, 477.

Hemicrepidius Germar.
Asaphes Kirby.

bilobatus Say. Coleop. Ind., 770.
decoloratus Say. *Ibid.*, 770.
memnonius Herbst. *Ibid.*, 770.

Cryptohypnus Eschscholtz

abbreviatus Say. Coleop. Ind., 722.

Melanactes LeConte.

morio Fabricius. Coleop. Ind., 772. (G.D.)
piceus DeGeer. *Ibid.*, 771.

Œstodes LeConte.

tenuicollis Randall. Trans. Am. Phil. Soc., x, 424.

Parallelosthetus Schwarz.

attenuatus Say. *Ludius*. Coleop. Ind., 736.

Trichopherus Mulsant and Godart.

abruptus Say. *Ludius*. Coleop. Ind., 737.

Agriotes Eschscholtz.

oblongicollis Melsheimer. Coleop. Ind., 741.

Oxygonus LeConte.

obesus Say. Coleop. Ind., 769.

Dolopius Eschscholtz.

lateralis Eschscholtz. *Sericosomus*. Coleop. Ind., 742.

Sericus Eschscholtz.

silaceus Say. *Sericosomus*. Coleop. Ind., 763. (C.C.)
viridanus Say. *Sericosomus*. Compl. writ., ii, 603.

Glyphonyx Candeze.

recticollis Say. Coleop. Ind., 743.
testaceus Melsheimer. *Ibid.*, 743.

Æolus Eschscholtz.

dorsalis Say. *Drasterius elegans*. Coleop. Ind., 735.

Elater Linnæus.

areolatus Say. *obliquus*. Coleop. Ind., 734.
collaris Say. *Ibid.*, 734.
linteus Say. *Ibid.*, 732.
manipularis Candeze. *Ibid.*, 732.
militaris Harris. Trans. Am. Ent. Soc., xii, 10. (A.B.C.)
mixtus Herbst. Trans. Am. Phil. Soc., x, 469.
mixtus var. **fusculus** LeConte. *Ibid.*, 468.
nigricans Germar. *Ibid.*, 468.
nigricollis Herbst. Coleop. Ind., 732.
nigrinus Paykull. Trans. Am. Ent. Soc., xii, 10. (F.K.)
pullus Germar. *Ibid.*, xii, 10.
rubricollis Herbst. Coleop. Ind., 733.
rubricus Say. *Ibid.*, 733.
sanguinipennis Say. *Ibid.*, 734.
semicinctus Randall. Trans. Am. Phil. Soc., x., 465. (A.B.C.)
vitiosus LeConte. *Ibid.*, 465.

Megapenthes Kiesenwetter.

limbalis Herbst. Coleop. Ind., 736.

Melanotus Eschscholtz.*

americanus Herbst. Coleop. Ind., 747.
communis Gyllenhal. *Ibid.*, 750.
cribulosus LeConte. Trans. Am. Phil. Soc., ser. 2, x, 479.
decumanus Erichson. Coleop. Ind., 749.
dubius LeConte. Trans. Am. Phil. Soc., Ser. 2, x, 479.
exuberans LeConte. *Ibid.*, Ser. 2, x, 479.
fissilis Say. Coleop. Ind., 750.
insipiens Say. Compl. Writ., ii, 622.
parumpunctatus Melsheimer. Coleop. Ind., 754
pertinax Say. *Ibid.*, 755.
sagittarius LeConte. *Ibid.*, 751.
tenax Say. *Ibid.*, 755.
trapezoideus LeConte. *Ibid.*, 752.
verberans LeConte. *Ibid.*, 753.

Cardiophorus Eschscholtz.

cardisce Say. Coleop. Ind., 720.
convexus Say. *Ibid.*, 721.

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* See also appendix.

gagates Erichson. *Ibid.*, 721.
robustus LeConte. *Ibid.*, 721.
sp.

Horistonotus Candeze.

curiatus Say. Coleop. Ind., 721.
simplex Say. Trans. Am. Ent. Soc., xii, 38.

Family MELASIDÆ.

(EUCNEMIDÆ.)

Melasis Olivier.

pecticornis Melsheimer. Coleop. Ind., 703.

Isorhipis Lacordaire.

Tharops.

ruficornis Say. Coleop. Ind., 703.

Deltometopus Bonvouloir.

amœnicornis Say. Coleop. Ind., 704.

Entomophthalmus Bonvouloir.

rufiolus LeConte. Coleop. Ind., 709.

Family THROSCIDÆ or TRIXAGIDÆ.

Throscus Latreille.

carinicollis Schæffer. Trans. Am. Ent. Soc., xliii, 22.
chevrolati Bonvouloir. Coleop. Ind., 776.

Family BUPRESTIDÆ.

Acmæodera Eschscholtz.

tubulus Fabricius. *culta.* Coleop. Ind., 794.

Chalcophora Solier.

fortis LeConte. Trans. Am. Phil. Soc., ii, 191.
liberta Germar. Coleop. Ind., 780.
virginiensis Drury. *Ibid.*, 780.

Dicerca Eschscholtz.

americana Herbst. Kafer, ix, 107.
caudata LeConte. Coleop. Ind., 781.
divaricata Say. *Ibid.*, 781.
lurida Fabricius. *Ibid.*, 782.
obscura Fabricius. *Ibid.*, 782.
prolongata LeConte. Trans. Am. Phil. Soc., xii, 194.
pugionata Germar. Coleop. Ind., 781.

punctulata Schonherr. Syn. Ins., 3, 123.
tenebrosa Kirby. Coleop. Can., 348.

Melanophila Eschscholtz.

acuminata DeGeer. *appendiculata. longipes.* Coleop. Ind., 786.
fulvoguttata Harris. Entomological Correspondence, 358.

Anthaxia Eschscholtz.

quercata Fabricius. *cyanella.* Coleop. Ind., 787. (F.K.)
viridifrons Laporte. *Ibid.,* 787.

Chrysobothris Eschscholtz.

azurea LeConte. Coleop. Ind., 791.
dentipes Germar. *Ibid.,* 788. (K.F.C.)
femorata Fabricius. Flat-headed apple borer. *Ibid.,* 789.
femorata var. **quadriimpressa.** Laporte and Gory. *iv-impressa.* Mon. Bupr., 2, 48.
floricola Gory. Coleop. Ind., 790.
harrisii Hentz. Jour. Acad. Nat. Sci. Phila., v, 373.
lesueuri Laporte and Gory. *misella.* Mon. Bupr., 2, 49.
pusilla Laporte and Gory. Coleop. Ind., 791.
scabripennis Laporte and Gory. Mon. Bupr., 2, 53. (K.F.C.)
sexsignata Say. Coleop. Ind., 791.

Actenodes Lacordaire.

acornis Say. Coleop. Ind., 792.

Eupristocerus Deyrolle.

cogitans Weber. Coleop. Ind., 796.

Agrilus Stephens.

acutipennis Mannerheim. Coleop. Ind., 800.
arcuatus Say. *Ibid.,* 799.
arcuatus var. **obliquus** LeConte. Trans. Am. Phil. Soc., ii, 243.
auricomus Frost. Can. Ent., xliv., 250. (A.B.C.)
bilineatus Weber. Coleop. Ind., 800.
cephalicus LeConte. Can., Ent., xliv., 249.
champlaini Frost. *Ibid.,* xliv., 245.
defectus LeConte. Trans. Am. Phil. Soc., ii, 234.
egenus Gory. Coleop. Ind., 804.
horni Kerremans. *blanchardi. Ibid.,* 801.
juglandis Knull. Ent. News, xxxi, 7.
lateralis Say. Coleop. Ind., 798.
masculinus Horn. *Ibid.,* 799.

obsoletoguttata Gory. *Ibid.*, 802.
otiosus Say. *Ibid.*, 798.
politus Say. *Ibid.*, 801.
ruficollis Fabricius. *Ibid.*, 798.
vittaticollis Randall. *Ibid.*, 800. (A.H.Me.)

Pachyscelus Solier.

ovatus Say. *lævigatus.* Coleop. Ind., 807.
purpureus Say. *Ibid.*, 807.

Brachys Solier.

ærosa Melsheimer. Coleop. Ind., 806.
æruginosa Gory. *Ibid.*, 806.
ovata Weber. *Ibid.*, 806.

Taphrocerus Solier.

gracilis Say. Coleop. Ind., 805.

Mastogenius Solier.

subcyaneus LeConte. Coleop. Ind., 795.

Family PSEPHENIDÆ.

Psephenus Haldeman.

lecontei LeConte. Coleop. Ind., 677.

Family DRYOPIDÆ.

Dryops Olivier.

fastigiatus Say. Coleop. Ind., 679.
lithophilus Germar. *Ibid.*, 678.
productus LeConte. Trans. Am. Ent. Soc., iii, 32.

Family ELMIDÆ.

Macronychus Müller.

glabratus Say. Coleop. Ind., 682.

Stenelmis Dufour.

crenatus Say. Coleop. Ind., 681.

Elmis Latreille.

elegans LeConte. Trans. Am. Ent. Soc., iii, 36.
foveatus LeConte. *Ibid.*, v, 53.
latiusculus LeConte. *Ibid.*, iii, 37.
quadrinotatus Say. Coleop. Ind., 679.
sp.
sp.

Family HETEROCERIDÆ.

Heterocerus Fabricius.

tristis Mannerheim. Coleop. Ind., 685.
ventralis Melsheimer. *Ibid.*, 684. (C.C.)

Family GEORYSSIDÆ

Georyssus Latreille.

pusillus LeConte. Coleop. Ind., 675.

Family DASCILLIDÆ.

Eurypogon Motschulsky.

niger Melsheimer. Coleop. Ind., 689.

Ptilodactyla Latreille.

serricollis Say. Coleop. Ind., 691.

Eucinetus Germar.

terminalis LeConte. Coleop. Ind., 692.

Ectopria LeConte.

nervosa Melsheimer. Coleop. Ind., 692. (C.C.)

Family HELODIDÆ (or CYPHONIDÆ.)

Helodes Latreille.

pulchella Guérin-Méneville. Coleop. Ind., 694. (C.C.)
thoracia Guérin-Méneville, *Ibid.*, 694.

Scirtes Illiger.

orbiculatus Fabricius. Coleop. Ind., 694.
tibialis Guérin-Méneville. *Ibid.*, 694. (F.K.)

Cyphon Paykull.

collaris Guérin-Méneville. Coleop. Ind., 696. (C.C.)
obscurus Guérin-Méneville. *Ibid.*, 695.
ruficollis Say. *Ibid.*, 695.
variabilis Thunberg. *Ibid.*, 696.

Family BYTURIDÆ.

Byturus Latreille.

unicolor Say. Raspberry fruit worm. **Raspberry bytu**
Coleop. Ind., 589.

Family DERMESTIDÆ.

Dermestes Linnæus.

caninus Germar. Coleop. Ind., 590.

lardarius Linnæus. Larder beetle. Ham beetle. Coleop. Ind., 591: Bur. Ent., Bull. 4 new ser. 107.

talpinus Mannerheim. Coleop. Ind., 591. (G.D.) (K.F.C.)

vulpinus Fabricius. *Ibid.*, 591.

Attagenus Latreille.

pellio Linnæus. Coleop. Can., 305. (C.C.)

piceus Olivier. Black carpet beetle. Coleop. Ind., 592: Bur. Ent., Bull. 4 new ser. 61.

Trogoderma Latreille.

ornatum Say. Coleop. Ind., 593. (C.C.)

tarsale Melsheimer. *Ibid.*, 593.

Cryptorophalum Guérin-Méneville.

triste LeConte. Coleop. Ind., 594.

Anthrenus Geoffroy.

scrophulariæ Linnæus. Carpet Beetle. "Buffalo bug." Coleop. Ind., 595: Bur. Ent., Bull. 4 new ser. 59.

scrophulariæ var. **lepidus** LeConte. Jour. N. Y. Ent. Soc., viii, 160.

verbasci Linnæus. Coleop. Ind., 597.

Family BYRRHIDÆ.

Cytilus Erichson.

alternatus Say. *sericeus*. Coleop. Ind., 673.

Syncalypta Stephens.

spinosa Rossi. Mem. Coleop., iii, 17. (H. E. Smith.)

Percinolus Mulsant.

undatus Melsheimer. *murinus*. Coleop. Ind., 673.

Byrrhus Linnæus.

americanus LeConte. Coleop. Ind., 673.

Family OSTOMIDÆ.

(TROGOSITIDÆ.)

Nemosoma Latreille.

parallelum Melsheimer. Proc. Acad. Nat. Sci. Phila., ii, 108.

Tenebroides Piller and Metterpacker.

americana Kirby. Coleop. Ind., 665. (K.F.C.)
bimaculata Melsheimer. *Ibid.,* 665. (C.S.)
corticalis Melsheimer. *Ibid.,* 664.
mauritanica Linnæus. *Ibid.,* 663.

Thymalus Duftschmid.

fulgidus Erichson. Coleop. Can., 733.

Family NOSODENDRONIDÆ.

Nosodendron Latreille.

unicolor Say. Coleop. Ind., 672.

Family NITIDULIDÆ.

Brachypterus Erichson.

urticæ Fabricius. Coleop. Ind., 630.

Cercus Latreille.

abdominalis Erichson. Coleop. Ind., 630.

Carpophilus Stephens.

brachypterus Say. Coleop. Ind., 633.
dimidiatus Fabricius. *Ibid.,* 632.
hemipterus Linnæus. *Ibid.,* 632.
niger Say. *Ibid.,* 632.

Colopterus Erichson.

Colastus.

maculatus Erichson. Trans. Am. Ent. Soc., vii, 282.
semitectus Say. Coleop. Ind., 634.
trunctatus Randall. *Ibid.,* 634.
unicolor Say. *Ibid.,* 634.

Conotelus Erichson.

obscurus Erichson. Coleop. Ind., 635.

Epuræa Erichson.

avara Randall. Coleop. Ind., 638.
helvola Erichson. *Ibid.,* 637.
labilis Erichson. *Ibid.,* 640.

Nitidula Fabricius.

rufipes Linnæus. Coleop. Ind., 641.
ziczac Say. *Ibid.*, 641.

Stelidota Erichson.

geminata Say. Coleop. Ind., 641.
octomaculata Say. *Ibid.*, 641. (M.P.Z.)

Phenolia Erichson.

grossa Fabricius. Coleop. Ind., 642.

Osmosita Erichson.

colon Linnæus. Coleop. Ind., 643.

Lobiopa Erichson.

undulata Say. *Soronia.* Coleop. Ind., 643.

Oxycnemis Erichson.

histrina LeConte. *Psilopyga.* Coleop. Ind., 645. (A.B.C.) (H.B.K.)

Meligethes Stephen.

æneus Fabricius. *brassicæ* Scopoli. Coleop. Ind., 644.

Pallodes Erichson.

silaceus Erichson. *pallidus.* Coleop. Ind., 646.

Cychramus Kugelan.

adustus Erichson. Coleop. Ind., 647. (C.C.)

Cryptarcha Shuckard.

ampla Erichson. Coleop. Ind., 648.

Glischrochilus Reitter.

Ips.

confluentus Say. Coleop. Ind., 650.
quadriguttatus Fabricius. *fasciatus.* *Ibid.*, 649.
sanguinolentus Olivier. *Ibid.*, 649.

Family RHIZOPHAGIDÆ.

Rhizophagus Herbst.

approximatus LeConte? Trans. Am. Ent. Soc., vii, 330.
bipunctatus Say. Coleop. Ind., 651. (C.C.)
minutus Mannerheim. *Ibid.*, 651. (C.C.)

Family MONOTOMIDÆ.

Europs Wollaston.

pallipennis LeConte. Coleop. Ind., 669. (C.S.)

Bactridium LeConte.

hudsoni Casey. Mem. Coleop., vii, 99.

Family CUCUJIDÆ.

Silvanus Latreille.

bidentatus Fabricius. Coleop. Ind., 562.
imbellis LeConte. *Ibid.*, 563.
planatus Germar. Trans. Amt. Ent. Soc., xi 72. (F.K.)

Oryzæphilus Ganglbauer.

surinamensis Linnæus. Saw-toothed grain weevil. Coleop. Ind., 562; Bur. Ent., Bull iv. new ser. 121.

Catogenus Westwood.

rufus Fabricius. Coleop. Ind., 564.

Cucujus Fabricius.

clavipes Fabricius. Coleop. Ind., 565.

Læmophlæus Laporte.

adustus LeConte. Coleop. Ind., 567. (C.C.)
biguttatus Say. *Ibid.*, 567.
convexulus LeConte. *Ibid.*, 566.
fasciatus Melsheimer. *Ibid.*, 567.
pusillus Schonherr. Trans. Am. Ent. Soc., xi. 93.
testaceus Fabricius. Coleop. Ind., 567. (C.C.)

Lathropus Erichson.

vernalis LeConte. Coleop. Ind., 568. (C.C.)

Dendrophagus Schonherr.

glaber LeConte. Coleop. Ind., 566.

Brontes Fabricius.

debilis LeConte. Coleop. Ind., 568. (C.C.)
dubius Fabricius. *Ibid.*, 568. (G.D.)

Telephanus Erichson.

velox Haldeman. Coleop. Ind., 567.

Family EROTYLIDÆ.

Languria Latreille.

gracilis Newman. Coleop. Ind., 543.
lecontei Crotch. *Ibid.*, 543.
mozardi Latreille. Clover stem borer. *Ibid.*, 542.
tædata LeConte. Jour. N. Y. Ent. Soc., xii. 199. (H.B.K.)

Acropteroxys Gorham.

lecontei Crotch. Coleop. Ind., 543.

Megalodacne Crotch.

fasciata Fabricius. Coleop. Ind., 545.
heros Say. *Ibid.*, 545.

Mycotretus Lacordaire.*

sanguinipennis Say. Coleop. Ind., 546. (K.F.C.)

Tritoma Fabricius.

angulata Say. Coleop. Ind., 548.
biguttata Say. *Ibid.*, 548.
flavicollis LeConte. *Ibid.*, 549.
humeralis Fabricius. *Ibid.*, 547.
thoracica Say. *Ibid.*, 549.
unicolor Say. *Ibid.*, 548.

Family DERODONTIDÆ.

Laricobius Rosenhauer.

erichsoni Rosenhauer. *rubidus.* New Spec. N. A. Coleop., 99.

Family CRYPTOPHAGIDÆ.

Telmatophilus Heer.

americanus LeConte. Coleop. Ind., 573.

Loberus LeConte.

impressus LeConte. Coleop. Ind., 573. (C.C.)

Tomarus LeConte.

pulchellus LeConte. Coleop. Ind., 574.

Antherophagus Latreille.

ochraceous Melsheimer. Coleop. Ind., 574.

* See also appendix.

Cryptophagus Herbst.

cellaris Scopoli. Coleop. Can., 295. (C.C.)
croceus Zimmerman. Coleop. Ind., 576.
nodangulus Zimmerman. *Ibid.*, 577.

Cænoscelis Thomson.

ferruginea Sahlberg. Coleop. Ind., 579.

Atomaria Stephens.

curtula Casey. Jour. N. Y. Ent. Soc., viii, 122.
ephippiata Zimmerman. Coleop. Ind., 581.
ovalis Casey. *Ibid.*, 581.
pusilla Paykull. *Ibid.*, 580. (C.W.L.)

Family MYCETOPHAGIDÆ.

Mycetophagus Hellwig.

bipustulatus Melsheimer. Coleop. Ind., 584. (C.C.)
flexuosus Say. *Ibid.*, 584.
melsheimeri LeConte. *Ibid.*, 584.
punctatus Say. *Ibid.*, 584.

Litargus Erichson.

didesmus Say. Coleop. Ind., 586.
tetraspilotus LeConte. *Ibid.*, 586. (A.B.C.)

Typhæa Stephens.

fumata Linnæus. Coleop. Ind., 587.

Family COLYDIIDÆ.

Synchita Hellwig.

fuliginosa Melsheimer. Coleop. Ind., 551.

Bitoma Herbst.

quadriguttata Say. Coleop. Ind., 552.

Colydium Fabricius.

lineola Say. Coleop. Ind., 555. (C.S.)

Cerylon Latreille.

castaneum Say. Coleop. Ind., 557.
sticticum Casey. Ann. N. Y. Acad. Sci., 1896, 336.

Philothermus Aubé.

glabriculus LeConte. Coleop. Ind., 557. (C.C.)

Family LATHRIDIIDÆ.

Lathridius Herbst.

liratus LeConte. Coleop. Ind., 653.

Enicmus Thomson.

minutus Linnæus. *Lathridius.* Coleop. Ind., 655.

Cartodere Thomson.

filiformis Gyllenhal. Coleop. Ind., 656.
ruficollis Marsham. *publicarius.* Trans. Am. Ent. Soc., xxvi, 137. (G.D.)

Corticaria Marsham.

ferruginea Marsham. *deleta.* Coleop. Ind., 658.
serrata Paykull. *Ibid.*, 658.

Melanophthalma Motschulsky

Corticaria.

cavicollis Mannerheim. Coleop. Ind., 661.
distinguenda Comolli. *Ibid.*, 660.
picta LeConte. *Ibid.*, 659. (C.C.)
pumila LeConte. *Ibid.*, 660. (C.C.)

Family MYCETÆIDÆ.

Mycetæa Stephens.

hirta Marsham. Trans. Am. Ent. Soc., iv, 362. (G.D.)

Family ENDOMYCHIDÆ.

Endomychus Panzer.

biguttatus Say. Coleop. Ind., 537.

Lycoperdina Latreille.

ferruginea LeConte. Coleop. Ind., 538.

Aphorista Gorham.

vittata Fabricius. Coleop. Ind., 538.

Mycetina Mulsant.

perpulchra Newman. Coleop. Ind., 539. (C.C.)

Stenotarsus Perty.

hispidus Herbst. Coleop. Ind., 539. (C.C.)
testacea Ziegler. *Mycetina.* Trans. Am. Ent. Soc., iv, 360. (G.D.)

Family PHALACRIDÆ.

Acylomus Sharp.

ergoti Casey. Coleop. Ind., 500.

Olibrus Erichson.

consimilis Marsham. *Eustilbus apicalis.* Coleop. Ind., 500. (C.C.)
pallipes Say. *Ibid.,* 499.
semistriatus LeConte. *Ibid.,* 499.

Phalacrus Paykull.

penicillatus Say. Compl. Writ., ii, 230.
politus Melsheimer. Coleop. Ind., 498.
pumilio LeConte. *Ibid.,* 499.

Family COCCINELLIDÆ.

Hyperaspis Redtenbacher.

fimbriolata Melsheimer. Coleop. Ind., 522.
signata Olivier var. **binotata** Say. *Ibid.,* 523: Conn. Agr. Expt. Sta., Bull. 181, 8.
signata var. **proba** Say. Coleop. Ind., 523.
undulata Say. *Ibid.,* 522.

Brachyacantha Chevrolat.

ursina Fabricius. Coleop. Ind., 520: Conn. Agr. Expt. Sta., Bull. 181, 9.

Microweisia Cockerell.

misella LeConte. *Pentilia. Smilia.* Conn. Agr. Expt. Sta., Rept. 1902, 128, Bull. 181, 8: Coleop. Ind., 524.

Scymnus Kugelan.

americanus Mulsant. Coleop. Ind., 528.
brullei Mulsant. Trans. Am. Ent. Soc., xxii, 101.
collaris Melsheimer. Coleop. Ind., 530.
fraternus LeConte. *Ibid.,* 529.
puncticollis LeConte. *Ibid.,* 530.
tenebrosus Mulsant. *Ibid.,* 531.

Delphastus Casey.

pusillus LeConte. Coleop. Ind., 519: Conn. Agr. Expt. Sta., Bull. 181, 9.

Coccidula Kugelan.

lepida LeConte. Coleop. Ind., 533: Conn. Agr. Expt. Sta., Bull. 181, 6.

Psyllobora Chevrolat.

viginti-maculata Say. *20-maculata.* Twenty-spotted lady beetle. Coleop. Ind., 517: Conn. Agr. Expt. Sta., Bull. 181, 12.

Anisosticta Duponchel.

seriata Melsheimer. *Nœmia.* Jour. N. Y. Ent. Soc., vii, 75: Conn. Agr. Expt. Sta., Bull. 181, 22.

strigata Thunberg. Coleop. Ind., 510: Conn. Agr. Expt. Sta., Bull. 181, 23.

Ceratomegilla Crotch.

fuscilabris Mulsant, *Megilla.* Spotted lady beetle. Erroneously *maculata* DeGeer, a tropical species. Coleop. Ind., 510: Conn. Agr. Expt. Sta., Bull. 181, 21.

Hippodamia Mulsant.

convergens Guérin-Méneville. Coleop. Ind., 512: Conn. Agr. Expt. Sta., Bull. 181, 18.

glacialis Fabricius. Coleop. Ind., 512: Conn. Agr. Expt. Sta., Bull. 181, 20.

parenthesis Say. Coleop. Ind., 511: Conn. Agr. Expt. Sta., Bull. 181, 20.

tredecempunctata Linnæus. *13-punctata.* Thirteen-spotted lady beetle. Coleop. Ind., 511: Conn. Agr. Expt. Sta., Bull. 181, 20.

Coccinella Linnæus.

monticola Mulsant. Jour. N. Y. Ent. Soc., vii, 89.

novemnotata Herbst. *9-notata.* Nine-spotted lady beetle. Coelop. Ind., 514: Conn. Agr. Expt. Sta., Bull. 181, 15.

perplexa Melsheimer. *trifasciata.* Jour. N. Y. Ent. Soc., vii, 89: Conn. Agr. Expt. Sta., 181, 16.

transversoguttata Fabricius. *5-notata.* Five-spotted lady beetle. Jour. N. Y. Ent. Soc., vii, 89: Conn. Agr. Expt Sta., Bull. 181, 16.

Cycloneda Crotch.

munda Say. Red lady beetle. Erroneously *Coccinella sanguinea*, a tropical species. Coleop. Ind., 515: Conn. Agr. Expt. Sta., Bull. 181, 17.

Adalia Mulsant.

bipunctata Linnæus. Two-spotted lady beetle. Coleop. Ind., 515: Conn. Agr. Expt. Sta., Bull. 181, 17.

frigida Schneider. Coleop. Ind., 516.

frigida var. **opthalmica** Mulsant. *Ibid.*, 516. (K.F.C.)

humeralis Say. ' *bipunctata* (or *frigida*) var. *humeralis*. Jour. N. Y. Ent. Soc., vii, 85: Conn. Agr. Expt. Sta., Bull. 181, 18.

Anisocalvia Crotch.

duodecimmaculata Gebler. *12-maculata*. Jour. N. Y. Ent. Soc., vii, 97.

Anatis Mulsant.

quindecimpunctata Olivier. *15-punctata*. Fifteen-spotted lady beetle. Coleop. Ind., 516: Conn. Agr. Expt. Sta., Rept. 1909-10, 705. Bull. 181, 13.

quindecimpunctata var. **mali** Say. Coleop. Ind., 516. (K.F.C.)

Neomysia Casey.

pullata Say. *Mysia*. Jour. N. Y. Ent. Soc., vii, 99.

Chilocorus Leach.

bivulnerus Mulsant. Twice-stabbed lady beetle. Conn. Agr. Expt. Sta., Rept. 1902, 127: Bull. 165, 15: Bull. 181, 10: Coleop. Ind., 518.

Harmonia Authors not Mulsant.

picta Randall. *Cleis*. Jour. N. Y. Ent. Soc., xi, 205: Conn. Agr. Expt. Sta., Bull. 181, 14.

similis Randall. *Cleis*. *Anisocalvia*. Jour. N. Y. Ent. Soc., xi, 206.

Epilachna Chevrolat.

borealis Fabricius. Squash lady beetle. Conn. Agr. Expt. Sta., Rept. 1908, 810: Bull. 181, 11: Coleop. Ind., 532.

Family ALLECULIDÆ.

(CISTELIDÆ.)

Lobopoda Solier (or **Allecula** Fabricius).

atra Say. Ann. N. Y. Acad. Sci., vi, 82. (T.L.C.)

Hymenorus Mulsant.

niger Melsheimer. *nigrinus*. Coleop. Ind., 1274.

pilosus Melsheimer. *Ibid.*, 1274: Ann. N. Y. Acad. Sci., vi, 93.

Pseudocistela Crotch.

brevis Say. Coleop. Ind., 1276.

Isomira Mulsant.

quadriseriata Couper. Coleop. Ind., 1277.

sericea Say. *Cistela. Ibid.,* 1277.

Mycetochara Berthold.

binotata Say. *Mycetochares.* Coleop. Ind., 1281.

Chromatica LeConte.

amœna Say. Coleop. Ind., 1276. (A.B.C.) (H.B.K.)

Capnochroa LeConte.

fuliginosa Melsheimer. Coleop. Ind., 1282.

Androchirus LeConte.

erythropus Kirby. Coleop. Ind., 1283.

Family TENEBRIONIDÆ.*

Hopatrinus Latreille.

minimus Beauvois. *notus.* Coleop. Ind., 1252.

Blapstinus Latreille.

interruptus Say. Coleop. Ind., 1253.

metallicus Fabricius. *Ibid.,* 1253.

mœstus Melsheimer. *Ibid.,* 1252.

Phaleria Latreille.

testacea Say. Long's Exp., ii, 280.

Bolitotherus Candeze.

cornutus Panzer. *bifurcus.* Coleop. Ind., 1267.

Bolitophagus Illiger.

corticola Say. Coleop. Ind., 1267.

Diaperis Geoffroy.

maculata Olivier. Coleop. Ind., 1261.

Hoplocephala Laporte.

bicornis Olivier. *Arrhenoplita.* Coleop. Ind., 1261.

Platydema Laporte.

ellipticum Fabricius. Coleop. Ind., 1263. (C.C.)

erythrocera Laporte. *Ibid.,* 1263.

excavatum Say. *Ibid.,* 1262.

ruficorne Sturm. *Ibid.,* 1263.

subcostatum Laporte. *Ibid.,* 1264.

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* See also appendix.

Tribolium MacLeay.

confusum Duval. Confused flour beetle. Coleop. Ind., 1255: Bur. Ent., new ser., Bull. iv, 113.

Diœdus LeConte.

punctatus LeConte. Coleop. Ind., 1256.

Palorus Mulsant.

depressus Fabricius. *melinus.* Illus. Besttabl. Kaf. Deutsch. 741.

Uloma Leporte.

impressa Melsheimer. Coleop. Ind., 1257.

Alphitobius Stephens.

diaperinus Panzer. Coleop. Ind., 1257. (C.C.)
piceus Olivier. Illus. Besttabl. Kaf. Deutsch., 748.

Hypophlœus Fabricius.

parallelus Melsheimer. Coleop. Ind., 1266. (G.D.)
tenuis LeConte. Proc. Am. Phil. Soc., xvii, 422.

Scotobates Horn.

calcaratus Fabricius. Coleop. Ind., 1248.

Xylopinus LeConte.

ænescens LeConte. Coleop. Ind., 1249.
saperdioides Olivier. *Ibid.,* 1249. (G.D.)

Hoplandrus LeConte.

fulvipes Herbst. *femoratus.* Coleop. Ind., 1248

Iphthimus Truqui.

opacus LeConte. Coleop. Ind., 1247. (G.D.)

Alobates Motschulsky.

pennsylvanica DeGeer. *Nyctobates.* Coleop. Ind., 1247.

Upis Fabricius.

ceramboides Linnæus. Ent. Syst., ii, 515. (G.D.)

Tenebrio Linnæus.

molitor Linnæus. Yellow meal worm. Bur. Ent., new ser. Bull. iv, 116: Coleop Ind., 1250.
obscurus Fabricius. Dark meal worm. Bur. Ent., new ser. Bull. iv, 117: Coleop. Ind., 1250.
picipes Herbst. *tenebroides.* Coleop. Ind., 1250.

Helops Fabricius.

æreus Germar. Coleop. Ind., 1268.

Tarpela Bates.

micans Fabricius. Coleop. Ind., 1268.

Meracantha Kirby.

contracta Beauvois. Coleop. Ind., 1269.

Strongylium Kirby.

tenuicolle Say. Coleop. Ind., 1270.

Family LAGRIIDÆ.

Arthromacra Kirby.

ænea Say. Coleop. Ind., 1284.

Statira Latreille.

gagatina Melsheimer. Coleop. Ind., 1285.

Family MELANDRYIDÆ.*

Penthe Newman.

obliquata Fabricius. Coleop. Ind., 1290.
pimelia Fabricius. *Ibid.*, 1290. (G.D.)

Synchroa Newman.

punctata Newman. Coleop. Ind., 1290.

Eustrophinus Seidletz.*

bicolor Say. *Eustrophus*. Trans. Am. Ent. Soc., **xv**. 34; Coleop. Ind., 1292.

Holostrophus Horn.

bifasciatus Say. Coleop. Ind., 1293. (G.D.)

Orchesia Latreille.

castanea Melsheimer. Coleop. Ind., 1294.
gracilis Melsheimer. *Ibid.*, 1294. (F.K.)

Melandrya Fabricius.

striata Say. Coleop. Ind., 1296.

Emmesa Newman.

connectens Newman. Ent. Mag., 5, 376.
labiata Say. Coleop. Ind., 1296.

Dircæa Fabricius.

quadrimaculata Say. *liturata*. Coleop. Ind., 1298.

Hypulus Paykull.

concolor LeConte. Coleop. Ind., 1298. (C.C.)

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* See also appendix.

Symphora LeConte.

rugosa Haldeman. Coleop. Ind., 1299. (C.C.)

Canifa LeConte.

pallipes Melsheimer. Coleop. Ind., 1301.

Mycterus Clairville.

scaber Haldeman. Trans. Am. Ent. Soc., vii. 337.

Family PTINIDÆ.

Ptinus Linnæus.

fur Linnæus. Coleop. Ind., 865. (K.F.C.)
villiger Reitter. *Ibid.,* 865.

Family ANOBIIDÆ.

Xestobium Motschulsky.

rufovillosum DeGeer. *tessellatum.* Coleop. Ind., 868.

Ernobius Thomson.

mollis Linnæus. Coleop. Ind., 868.

Sitodrepa Thomson.

panicea Linnæus. Drug-store beetle. Coleop. Ind., 870.

Trichodesma LeConte.

gibbosa Say. Coleop. Ind., 871.
klagesi Fall. *Ibid.,* 871. (A.B.C.)

Hadrobregmus Thomson.

carinatus Say. Coleop. Ind., 872.

Trypopitys Redtenbacher.

sericeus Say. Coleop. Ind., 872.

Xyletinus Latreille.

peltatus Harris. Coleop. Ind., 874.

Lasioderma Stephens.

testaceum Duftschmid. *serricorne.* Cigarette beetle. Coleop. Ind., 875: Rept. Conn. Agr. Expt. Sta., 1906. 278.

Dorcatoma Herbst.

setulosum LeConte. Coleop. Ind., 883. (C.C.)

Cænocara Thomson.

oculata Say. Coleop. Ind., 884.

Family BOSTRICHIDÆ.

Endecatomus Mellié.

reticulatus Herbst. Coleop. Ind., 887.
rugosus Randall. *Ibid.*, 887.

Xylobiops Casey.

basilare Say. *Sinoxylon*. Coleop. Ind., 888.

Lichenophanes Lesne.

armiger LeConte. *Bostrichus*. Coleop. Ind., 888.

Bostrichus Geoffroy.

angustus Casey. Jour. N. Y. Ent. Soc., vi, 72.
bicornis Weber. Coleop. Ind., 889. (C.C.)

Dinoderus Stephens.

rugosus Oliver. *porcatus* LeConte. Coleop. Ind., 890.
punctatus Say. *Ibid.*, 890.

Family LYCTIDÆ.

Lyctus Fabricius.

opaculus LeConte. Coleop. Ind., 892.
linearis Goeze. *striatus*. *unipunctatus*. Powder post beetle. Coleop. Ind., 891: Bur. Ent., Circ. 55.

Family SPHINDIDÆ.

Sphindus Chevrolat.

americanus LeConte. Coleop. Ind., 902. (C.C.)

Family CISIDÆ.

Orthocis Casey.

punctulatus Mellié. Coleop. Ind., 899.

Octotemnus Mellié.

denudatus Casey. Jour. N. Y. Ent. Soc., vi, 91.

Ceracis Mellié.

sallei Mellié. Coleop. Ind., 900.

Cis Latreille.

dubius Mellié. Ann. Soc. Ent. Fr., 2d. vi, 272.
fuscipes Mellié. Coleop. Ind., 898.
sp.

Xestocis Casey.

levettei Casey. Coleop. Ind., 899.

Ennearthron Mellié.

thoracicorne Ziegler. Coleop. Ind., 900.
sp.

Family SCARABÆIDÆ.

Canthon Hoffman.

lævis Drury. Coleop. Ind., 914.
nigricornis Say. *Ibid.*, 914. (G.D.)

Chœridium Lepeletier.

histeroides Weber. Coleop. Ind., 915.

Copris Geoffroy.

minutus Drury. Coleop. Ind., 916.
tullius Olivier. *anaglypticus*. *Ibid.*, 916.

Pinotus Erichson.

carolina Linnæus. *Copris*. Coleop. Ind., 916.

Phanæus MacLeay.

carnifex Linnæus. Coleop. Ind., 917.

Onthophagus Latreille.

hecate Panzer. Coleop. Ind., 918.
janus Panzer. *Ibid.*, 919.
janus var. **orpheus** Panzer. *Ibid.*, 919. (A.H.Me.)
janus var. **striatulus** Beauvois. *Ibid.*, 919.
pennsylvanicus Harold. *Ibid.*, 920.

Aphodius Illiger.*

congregatus Mann. Trans. Am. Ent. Soc., xiv. 12. (C.C.)
distinctus Müller. *inquinatus* Herbst. Coleop. Ind., 933.
femoralis Say. *Ibid.*, 934. (K.F.C.)
fimetarius Linnæus. *Ibid.*, 930.
fossor Linnæus. Trans. Am. Ent. Soc., xiv. 4.
granarius Linnæus. Coleop. Ind., 931.
terminalis Say? *Ibid.*, 933.
vittatus Say. *Ibid.*, 931.

Atænius Harold.

abditus Haldeman. Coleop. Ind., 926. (C.C.)
cognatus LeConte. *Ibid.*, 926.
gracilis Melsheimer. *Ibid.*, 925.

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* See also appendix.

Eucanthus Westwood.

lazerus Olivier. *Bolboceras.* Coleop. Ind., 937.

Bolbocerasoma Schæffer.

farctum Fabricius. *Bolboceras.* Coleop. Ind., 937.

Odontæus Megerle.

cornigerus Melsheimer. Coleop. Ind., 938. (C.C.)
filicornis Say. *Ibid.*, 938. (C.C.)

Geotrupes Fabricius.

balyi Jekel. Trans. Am. Ent. Soc., viii. 145.
blackburnii Fabricius. Coleop. Ind., 939.
egeriei Germar. Trans. Am. Ent. Soc., viii. 145.
hornii Blanchard. Psyche v. 107.
semiopacus Jekel. Coleop. Ind., 939.
splendidus Fabricius. *Ibid.*, 939.

Amphicoma Latreille.

vulpina Hentz. Trans. Am. Ent. Soc., x. 120.

Trox Fabricius.

æqualis Say. Coleop. Ind., 946.
capillaris Say. *Ibid.*, 945.
erinaceus LeConte. *Ibid.*, 944. (C.C.)
foveicollis Harris. Trans. Am. Ent. Soc., v, 10.
insularis Chevrolat. Coleop. Ind., 945.
scaber Linnæus. *Ibid.*, 946.
sordidus LeConte. *Ibid.*, 945.
terrestris Say. *Ibid.*, 946.
unistriatus Beauvois. *Ibid.*, 945.

Serica Mac Leay.

cucullata Dawson. Jour. N. Y. Ent. Soc., xxvii, 34.
sericea Illiger. Coleop. Ind., 958.
tristis LeConte. *Ibid.*, 958.
trociformis Burmeister. *Ibid.*, 958.
vespertina Gyllenhal. *Ibid.*, 956.

Diplotaxis Kirby.

atlantis Fall. Trans. Am. Ent. Soc., xxxv. 44.
liberta Germar. Coleop. Ind., 954.
sordida Say. *Ibid.*, 955.
tristis Kirby. *Ibid.*, 954. (F.K.)

Phyllophaga Harris.

Lachnosterna Hope.

May or June Beetles.

anxia LeConte. *dubia.* *insperata.* Coleop. Ind., 970. (J.K.L.)
crenulata Frohlich. *Ibid.*, 979.
drakei Kirby. *grandis.* *Ibid.*, 970.
fœrsteri Burmeister. *nova.* *Ibid.*, 972.
fraterna Harris. *Ibid.*, 972.
fusca Frohlich. *Ibid.*, 968.
gracilis Burmeister. *Ibid.*, 964.
hirsuta Knoch. *Ibid.*, 974. (A.B.C.)
hirticula Knoch. *Ibid.*, 976.
ilicis Knoch. *ciliata.* *Ibid.*, 978.
marginalis LeConte. *Ibid.*, 970. (A.B.C.)
micans Knoch. *Ibid.*, 967. (C. W. F. Wagner.)
tristis Fabricius. *Ibid.*, 979.

Polyphylla Harris.

variolosa Hentz. Trans. Am. Ent. Soc., ix, 75. (G.D.) (J.K.L.)

Dichelonyx Harris.

albicollis Burmeister. Coleop. Ind., 953.
diluta Fall. *Ibid.*, 952.
elongata Fabricius. *Ibid.*, 952.
testacea Kirby. *Ibid.*, 951. (K.F.C.)

Hoplia Illiger.

equina LeConte. Trans. Am. Ent. Soc., viii. 193.
limbata LeConte. *modesta.* Coleop. Ind., 950.
trifasciata Say. *Ibid.*, 949.

Macrodactylus Latreille.

subspinosus Fabricius. Rose chafer. Rose beetle. Bur. Ent., Circ. 11: Rept. Conn. Agr. Expt. Sta., 1916, 111.

Anomala Samouelle.

binotata Gyllenhal. Coleop. Ind., 982: Rept. Conn Agr. Expt. Sta., 1902, 176.

Hemispilota Casey.

lucicola Fabricius. *Anomala.* Coleop. Ind., 985.

Pelidnota MacLeay.

punctata Linnæus. Spotted grape-vine beetle. Coleop. Ind., 986.

Cotalpa Burmeister.

lanigera Linnæus. Goldsmith beetle. Coleop. Ind., 987.

Dyscinetus Harold.

trachypygus Burmeister. Coleop. Ind., 990.

Ligyrus Burmeister.

gibbosus DeGeer. Coleop. Ind., 991.

Ligyrodes Casey.

relictus Say. Coleop. Ind., 992.

Aphonus LeConte.

castaneus Melsheimer. Mem. Coleop., vi, 220.
tridentatus Say. Coleop. Ind., 992. (G.D.)

Xyloryctes Hope.

satyrus Fabricius. Coleop. Ind., 992.

Cotinis Burmeister.

nitida Linnæus. *Allorhina.* Coleop. Ind., 996.

Euphoria Burmeister.

fulgida Fabricius. Coleop. Ind., 998.
inda Linnæus. Bumble flower beetle. *Ibid.,* 998.

Stephanucha Burmeister.

areata Fabricius. Coleop. Ind., 997.

Cremastocheilus Knoch.

canaliculatus Kirby. Coleop. Ind., 1000.
castaneæ Knoch. *Ibid.,* 1000.
harrisii Kirby. *Ibid.,* 1000. (C.C.)
variolosus Kirby. *Ibid.,* 999.

Osmoderma Lepeletier.

eremicola Knoch. Coleop. Ind., 1001.
scabra Beauvois. *Ibid.,* 1002.

Gnorimella Casey.

maculosus Knoch. *Gnorimus.* Coleop. Ind., 1002.

Trichionotus Casey.

affinis Gory. Coleop. Ind., 1004.
piger Fabricius. *Ibid.,* 1003.

Valgus Scriba.

squamiger Beauvois. Coleop. Ind., 1005.

Family LUCANIDÆ.

Lucanus Linnæus.

capreolus Linnæus. *dama.* Stag beetle. Coleop. Ind., 905.

Dorcus MacLeay.

parallelus Say. Coleop. Ind., 906.

Platycerus Geoffroy.

quercus Weber. Coleop. Ind., 907.

Ceruchus MacLeay.

piceus Weber. Coleop. Ind., 907. (G.D.)

Family PASSALIDÆ.

Passalus Fabricius.

cornutus Fabricius. Coleop. Ind., 908.

Family CERAMBYCIDÆ.

Parandra Latreille.

brunnea Fabricius. Coleop. Ind., 1007.

Derobrachus Serville.

brunneum Fœrster. *Orthosoma.* Lesser Prionus. Coleop. Ind., 1011.

Prionus Geoffroy.

laticollis Drury. Broad-horned Prionus. Coleop. Ind., 1011.
pocularis Dalman. *Ibid.,* 1012. (A.H.Me.)

Distenia Serville.

undata Olivier. Coleop. Ind., 1043.

Smodicum Haldeman.

cucujiforme Say. Coleop. Ind., 1016.

Asemum Eschscholtz.

mœstum Haldeman. Coleop. Ind., 1014.

Tetropium Kirby.

cinnamopterum Kirby. Coleop. Ind., 1015.

Criocephalus Mulsant.

argestis Kirby. Coleop. Ind., 1015.
obsoletus Randall. *Ibid.,* 1015.

Œme Newman.

rigida Say. Bull. Brook. Ent. Soc., vii, 116.

Tylonotus Haldeman.

bimaculatus Haldeman. Coleop. Ind., 1026.

Stromatium Serville.

pubescens Haldeman. Coleop. Ind., 1022.

Chion Newman.

cinctus Drury. Coleop. Ind., 1022. (A.H.Me.)

Romaleum White.

atomarium Drury. Coleop. Ind., 1023.
rufulum Haldeman. *Ibid.,* 1023.

Hypermallus Lacordaire.

villosum Fabricius. *parallelum.* Twig pruner. Coleop. Ind., 1025.

Elaphidion Serville.

mucronatum Say. Coleop. Ind., 1024.

Pseudibion Casey.

unicolor Randall. Coleop. Ind., 1026.

Heterachthes Newman.

ebenus Newman. Mem. Coleop., iii, 307.
quadrimaculatus Haldeman. Coleop. Ind., 1027.

Obrium Serville.

rufulum Gahan. *rubrum.* Coleop. Ind., 1028.

Rhagium Fabricius.

lineatum Olivier. Coleop. Ind., 1048.

Centrodera LeConte.

decolorata Harris. Coleop. Ind., 1048. (K.F.C.)
picta Haldeman. *Ibid.,* 1048.

Stenocorus Fabricius.

trivittatus Say. *Toxotus.* Coleop. Ind., 1047.

Hapalosalia Casey.

vibex Newman. *Leptura.* Coleop. Ind., 1059. (F.K.)

Acmæops LeConte.

directa Newman. Coleop. Ind., 1050.
thoracica Haldeman. Ent. Am., vi, 104.

Gaurotes LeConte.

cyanipennis Say. Coleop. Ind., 1050.

Anthophilax LeConte.

malachiticus Haldeman. Ent. Amer., vi, 98. (M.P.Z.)

Judolia Mulsant.

cordifera Olivier. Ent. Am., vi, 188.

Brachyleptura Casey.

rubrica Say. Coleop. Ind., 1057.

Parallelina Casey.

exigua Newman. Coleop. Ind., 1056.

Strongalepta Casey.

lineola Say. Coleop. Ind., 1055.
pubera Say. *Ibid.,* 1059.
vittata Germar. *Ibid.,* 1059.
vittata var. *Ibid.,* 1059.

Xestoleptura Casey.

octonotata Say. Coleop. Ind., 1058.

Strophiona Casey.

nitens Fœrster. *zebra.* Coleop. Ind., 1056.

Leptura Linnæus.

biforis Newman. Mem. Coleop., iv, 271. (E.L.D.)
canadensis Olivier. Coleop. Ind., 1057. (K.F.C.)
emarginata Fabricius. *Ibid.,* 1055. (A.B.C.)
hæmatites Newman. Entomologist, 73. (C.W.L.)
mutabilis Newman. Coleop. Can., 623.
vagans Olivier. Coleop. Ind., 1057. (K.F.C.)

Typocerus LeConte.

acuticauda Casey. Mem. Coleop., iv, 274. (H.L.J.)
velutinus Olivier. Coleop. Ind., 1053.

Ophistomis Thomson.

Strangalia.

acuminata Olivier. Coleop. Ind., 1051.
famelica Newman. *Ibid.,* 1051.
luteicornis Fabricius. *Ibid.,* 1052.

Encyclops Fabricius.

cæruleus Say. Coleop. Ind., 1045. (G.D.)

Desmocerus Serville.

palliatus Fœrster. Coleop. Ind., 1044.

Molorchus Fabricius.

bimaculatus Say. Coleop. Ind., 1028.

Merium Kirby.

proteus Kirby. Coleop. Ind., 1019. (C.C.)

Anacomis Casey.

ligneus Fabricius. *Hylotrupes.* Coleop. Ind., 1019.

Callidium Fabricius.

antennatum Newman. Coleop. Ind., 1019.
frigidum Casey. Mem. Coleop., viii, 289.
janthimum LeConte. Coleop. Ind., 1019.

Phymatodes Mulsant.

æreum Newman. Coleop. Ind., 1019.
amœnus Say. *Ibid.,* 1018.
dimidiatus Kirby. *Ibid.,* 1018.
variabilis Fabricius. *Ibid.,* 1018.
varius Fabricius. *Ibid.,* 1018.

Cyllene Newman.

caryæ Gahan. *pictus.* Hickory borer. Coleop. Ind., 1033.
robiniæ Fœrster. Locust borer. *Ibid.,* 1034: Bur. Ent., Cir., 83.

Arhopalus Serville.

fulminans Fabricius. Coleop. Ind., 1035.

Glycobius LeConte.

speciosus Say. *Plagionotus.* Maple borer. Rept. Conn. Agr. Expt. Sta., 1900. 337: 1907. 336: Coleop. Ind., 1034.

Calloides LeConte.

nobilis Harris. Coleop. Ind., 1035.

Xylotrechus Chevrolat.

aceris Fisher. Proc. Wash. Ent. Soc., xviii, 215.
colonus Fabricius. Coleop. Ind., 1037.
quadrimaculatus Haldeman. *Ibid.,* 1036. (A.B.C.)
saggitatus Germar. *Ibid.,* 1037. (A.B.C.)
undulatus Say. *Ibid.,* 1037.
undulatus var. **fuscus** Kirby. *Ibid.,* 1037.

Neoclytus Thomson.

acuminatus Fabricius. *erythrocephalus.* Coleop. Ind., 1038.
capræa Say. *Ibid.,* 1039.
muricatulus Kirby. *Ibid.,* 1038.

Anthoboscus Chevrolat.

ruricola Olivier. *Clytanthus.* Coleop. Ind., 1039.

Clytus Laichartig.

marginicollis Laporte. Coleop. Ind., 1040.

Cyrtophorus LeConte.

verrucosus Olivier. Coleop. Ind., 1040.

Tillomorpha Blanchard.

geminata Haldeman. Coleop. Ind., 1040. (A.B.C.)

Euderces LeConte.

picipes Fabricius. Coleop. Ind., 1041.

Stenosphenus Haldeman.

notatus Olivier. Coleop. Ind., 1032.

Purpuricenus Serville.

axillaris Haldeman. Coleop. Ind., 1031. (A.B.C.)
humeralis Fabricius. *Ibid.,* 1030.

Batyleoma Casey.

suturalis Say. *Batyle.* Coleop. Ind., 1031.

Cyrtinus LeConte.

pygmæus Haldeman. Coleop. Ind., 1062. (A.B.C.)

Psenocerus LeConte.

supernotatus Say. Coleop. Ind., 1062.

Monohammus Serville.

notatus Drury. *confusor.* Trans. Am. Ent. Soc., xxiii, 109.
marmorator Kirby. *Ibid.,* xxiii, 109.
scutellatus Say. Coleop. Ind., 1065.
titillator Fabricius. *Ibid.,* 1064.

Dorcaschema LeConte.

nigrum Say. Coleop. Ind., 1066. (D.J.C.)

Hetœmis Haldeman.

cinerea Olivier. Coleop. Ind., 1066.

Cacoplia LeConte.

pullata Haldeman. Trans. Am. Ent. Soc., xxiii, 111.

Goes LeConte.

pulchra Haldeman. Coleop. Ind., 1067.
pulverulenta Haldeman. *Ibid.,* 1067.
tigrina DeGeer. Coleop. Ind., 1067.

Ægomorphus Haldeman.

decipiens Haldeman. *Acanthoderes.* Coleop. Ind., 1070.

Leptostylus LeConte.*

collaris Haldeman. Coleop. Ind., 1071.
guttata Say. *sexguttata.* *Ibid.,* 1072.

* See also appendix.

Astylopsis Casey.

macula Say. Coleop. Ind., 1072.

Leiopus Serville.

alpha Say. Coleop. Ind., 1074.
punctatus Haldeman. *Ibid.*, 1074. (C.C.)
variegatus Haldeman. *Ibid.*, 1074.

Lepturges Bates.

querci Fitch. Coleop. Ind., 1077.
facetus Say. *Ibid.*, 1077.
signatus LeConte. *Ibid.*, 1076.
symmetricus Haldeman. *Ibid.*, 1076.

Hyperplatys Haldeman.

aspersus Say. Coleop. Ind., 1078.
maculatus Haldeman. *Ibid.*, 1078.

Urographis Horn.

fasciatus DeGeer. *Graphisurus.* Coleop. Ind., 1079.

Dectes LeConte.

spinosus Say. Coleop. Ind., 1075.

Hoplosia Mulsant.

nubila LeConte. Trans. Am. Ent. Soc., xxiii, 134.

Pogonocherus Latreille.

mixtus Haldeman. Coleop. Ind., 1081.

Encyrus LeConte.

dasycerus Say. Coleop. Ind., 1081.

Eupogonius LeConte.

vestitus Say. Coleop. Ind., 1082. (A.B.C.) (H.B.K.)

Oncideres Serville.

cingulata Say. Hickory twig-girdler. Fifth Rept.. U. S. Ent. Com., 288.

Saperda Fabricius.

candida Fabricius. Round-headed apple borer. Rept. Conn. Agr. Expt. Sta., 1907. 333: N. Y. State Mus., Bull. 74. 23.
calcarata Say. Poplar borer. Coleop. Ind., 1086. N. Y. State Mus. Bull. 74. 39.
concolor LeConte. var. **unicolor** Joutel. Willow Borer. N. Y. State Mus. Bull. 74. 74: Coleop. Ind., 1086.

cretata Newman. Spotted apple tree borer. Coleop. Ind., 1088. N. Y. State Mus., Bull. 74. 50. (C.C.)
discoidea Fabricius. Hickory borer. Coleop. Ind., 1089. N. Y. State Mus., Bull. 74. 52.
lateralis Fabricius. Red-edged Saperda. Coleop. Ind., 1088: N. Y. State Mus., Bull. 74, 59.
mœsta LeConte. Coleop. Ind., 1085. N. Y. State Mus., Bull. 74. 71. (C.C.)
obliqua Say. Alder borer. N. Y. State Mus., Bull. 74, 18.
puncticollis Say. Coleop. Ind., 1085. (A.B.C.)
tridentata Olivier. Elm borer. Coleop. Ind., 1087. N. Y. State Mus., Bull. 74, 44.
vestita Say. Linden borer. Coleop. Ind., 1089: N. Y. State Mus. Bull. 74. 54.

Oberea Mulsant.*

bimaculata Olivier var. **basalis.** LeConte. Coleop. Ind., 1092.
ocellata Haldeman. *Ibid.,* 1092.
ruficollis Fabricius. Trans. Am. Ent. Soc., vii. 47.
schaumii LeConte. Coleop. Ind., 1091. (F.K.)
tripunctata Swederus. *Ibid.,* 1092.
tripunctata var. **mandarina** Fabricius. Trans. Am. Ent. Soc., vii, 47.

Tetraopes Serville.

canteriator Drapiez. Coleop. Ind., 1094.
tetraophthalmus Fœrster. *Ibid.,* 1094.

Family CHRYSOMELIDÆ.

Donacia Fabricius.

cincticornis Newman. Coleop. Ind., 1102.
dives LeConte. Proc. Acad. Nat. Sci. Phila., v, 314.
emarginata Kirby. Coleop. Ind., 1106.
flavipes Kirby. *Ibid.,* 1106.
hirticollis Kirby. Trans. Am. Ent. Soc., xviii, 164.
metallica Ahrens. Coleop. Ind., 1106.
palmata Olivier. *Ibid.,* 1102.
piscatrix Lacordaire. *Ibid.,* 1103. (K.F.C.)
rufa Say. *Ibid.,* 1107.
subtilis Kunze. *Ibid.,* 1103.
torosa LeConte. *Ibid.,* 1102.

* See also appendix.

tuberculata Lacordaire. Trans. Am. Ent. Soc., xviii, 171.
harrisi LeConte. *Ibid.*, 172.
sp.

Orsodacna Latreille.

atra Ahrens. var. **hepatica** Say. Coleop. Ind., 1108.
atra Ahrens var. **vittata** Say. *Ibid.*, 1108.

Zeugophora Kunze.

consanguinea Crotch. Coleop. Ind., 1109.
scutellaris Suffrian. *Ibid.*, 1109.

Syneta Lacordaire.

ferruginea Germar. Coleop. Ind., 1110.

Lema Fabricius.

brunnicollis Lacordaire. Coleop. Ind., 1111. (A.B.C.)
conjuncta Lacordaire. Proc. Phila. Acad. Nat. Sci., 1873, 25.
trilineata Olivier. Old-fashioned potato beetle. Coleop. Ind., 1111.

Crioceris Geoffroy.

asparagi Linnæus. Common asparagus beetle. Conn. Agr. Expt. Sta., 1902, 172: Bur. Ent., Circ., 102.
duodecimpunctata Linnæus. Twelve-spotted asparagus beetle. Bur. Ent., Circ. 102. 9.

Antipus DeGeer.

laticlavia Fœrster. *Anomœa*. Coleop. Ind., 1113.

Coscinoptera Lacordaire.

dominicana Fabricius. Coleop. Ind., 1113.

Babia Chevrolat.

quadriguttata Olivier. Coleop. Ind., 1114.

Saxinis Lacordaire.

omogera LeConte. Coleop. Ind., 1114. (G.D.)

Chlamys Knoch.

gibbosa Fabricius. *plicata*. Coleop. Ind., 1115.

Exema Lacordaire.

conspersa Mannerheim. Proc. U. S. Nat. Mus., xx, 480.

Bassareus Haldeman.

formosus Melsheimer. Coleop. Ind., 1119.
formosus var. **sulphuripennis** Melsheimer. *Ibid.*, 1119.
literatus Fabricius. *Ibid.*, 1120.

literatus var. **lativittus** Germar. *Ibid.*, 1120.
mammifer Newman. *Ibid.*, 1119. (G. D.)
sellatus Suffrian. *Ibid.*, 1119.

Cryptocephalus Geoffroy.

insertus Haldeman. Coleop. Ind., 1123.
mutabilis Melsheimer. *Ibid.*, 1123.
notatus Fabricius var. **quadrimaculatus** Say. *Ibid.*, 1122.
ornatus Fabricius. Trans. Am. Ent. Soc., xviii, 201. (H.L.J.)
quadruplex Newman. Coleop. Ind., 1122. (A.B.C.)
trivittatus Olivier. *Ibid.*, 1123.
venustus Fabricius. *Ibid.*, 1123.
venustus var. **cinctipennis** Randall. *Ibid.*, 1123.
venustus var. **hamatus** Melsheimer. *Ibid.*, 1123. (A.B.C.)
venustus var. **ornatus** Fabricius. *Ibid.*, 1123. (H.L.J.)

Pachybrachys Chevrolat.

atomarius Melsheimer. *infaustus*. Coleop. Ind., 1129.
carbonarius Haldeman. *Ibid.*, 1127.
confederatus Fall. Trans. Am. Ent. Soc., xli, 387.
femoratus Olivier. Coleop. Ind., 1131.
hepaticus Melsheimer. *Ibid.*, 1130.
luridus Fabricius. *Ibid.*, 1130.
m-nigrum Melsheimer. *intricatus*. Trans. Am. Ent. Soc., viii, 207.
othonus Say. Coleop. Ind., 1128.
pubescens Olivier. *morosus*. Trans. Am. Ent. Soc., viii, 206.
subfasciatus LeConte. Coleop. Ind., 1130.
tridens Melsheimer. *Ibid.*, 1129.
trinotatus Melsheimer. *Ibid.*, 1128.

Monachus Chevrolat.

saponatus Fabricius. Coleop. Ind., 1133.

Diachus LeConte.

auratus LeConte. Coleop. Ind., 1133.
pallidicornis Suffrian. *Ibid.*, 1133.

Triachus LeConte.

atomus Suffrian. Coleop. Ind., 1134.
cerinus LeConte. Trans. Am. Ent. Soc., viii, 197. (G.D.)

Chrysodina Baly.

globosa Say. Trans. Am. Ent. Soc., xix, 233.

Nodonota Lefévre.

puncticollis Say. Coleop. Ind., 1149: Trans. Am. Ent. Soc., xix, 232.

Colaspis Fabricius.

brunnea Fabricius. Brown Colaspis. Coleop. Ind., 1147.

Graphops LeConte.

pubescens Melsheimer. Coleop. Ind., 1144.

Xanthonia Baly.

decemnotata Say. Coleop. Ind., 1142.
villosula Melsheimer. *Ibid.,* 1142.

Fidia Baly.

viticida Walsh. Grape vine root worm. Coleop. Ind., 1143: N. Y. State Mus., Bull. 72.

Metachroma LeConte.

pallida Say. Coleop. Ind., 1146.

Adoxus Kirby.

obscurus Linnæus. Coleop. Ind., 1136.

Tymnes Chapuis.

tricolor Fabricius. Coleop. Ind., 1141.

Glyptoscelis LeConte.

barbata Say. Coleop. Ind., 1137.
pubescens Fabricius. *Ibid.,* 1137.

Paria LeConte.

Typophorus.

canellus Fabricius var. **atterrimus** Olivier. Coleop. Ind., 1139.
canellus var. **gilvipes** Horn. Trans. Am. Ent. Soc., xix, 208.
canellus var. **notatus** Say. Compl. Writ., ii, 213.
canellus var. **pumilis** LeConte. Coleop. Ind., 1139.
canellus var. **quadriguttatus** Horn. Coleop. Ind., 1140.
canellus var. **quadrinotatus** Say. *Ibid.,* 1139.
canellus var. **thoracicus** Melsheimer. *Ibid.,* 1139.

Chrysochus Chevrolat.

auratus Fabricius. Coleop. Ind., 1141.

Prasocuris Latreille.

phellandrii Linnæus. Coleop. Ind., 1151.
vittata Olivier. Coleop. Ind., 1151. (K.F.C.)

Labioderma Chevrolat.

clivicollis Kirby. Coleop. Ind., 1152: Jour. N. Y. Ent. Soc., iv, 195.

Leptinotarsa Stål.

decemlineata Say. *Doryphora. 10-lineata.* Colorado potato beetle. Potato bug. Coleop. Ind., 1153: Conn. Agr. Expt. Sta., Bull. 208, 106.

Zygogramma Chevrolat.

suturalis Fabricius. Coleop. Ind., 1154: Jour. N. Y. Ent. Soc., iv, 197.

Calligrapha Erichson.

elegans Olivier. *Chrysomela.* Coleop. Ind., 1156: Jour. N. Y. Ent. Soc., iv, 198.

lunata Fabricius. *hybrida.* Jour. N. Y. Ent. Soc., iv, 198.

multipunctata Say. var. **bigsbyana** Kirby. *Chrysomela.* Coleop. Ind., 1158: Jour. N. Y. Ent. Soc., iv, 199.

philadelphica Linnæus. Coleop. Ind., 1158.

philadelphica var. **spireæ** Say. Jour. N. Y. Ent. Soc., xiv, 199.

rhoda Knab. Proc. Wash. Ent. Soc., xi, 83. (G.D.)

rowena Knab. *Ibid.,* xi, 85. (G.D.)

scalaris LeConte. *Chrysomela.* Coleop. Ind., 1157: Jour. N. Y. Ent. Soc., iv, 199.

similis Rogers. Coleop. Ind., 1156.

Phædon Latreille.

armoraciæ Linnæus *cochleariæ* Gyllenhal. *Plagiodera.* Can. Ent., xxviii, 202.

Gastroidea Hope.

cyanea Melsheimer. Coleop. Ind., 1159.

polygoni Linnæus. *Ibid.,* 1159.

Lina Megerle.

lapponica Linnæus. *Melasoma. interrupta.* Coleop. Ind., 1160.

scripta Fabricius. Cottonwood leaf beetle. *Ibid.,* 1160. N. Y. Agr. Expt. Sta., Bull. 143.

tremulæ Fabricius. Coleop. Ind., 1160.

Phyllodecta Kirby.

vulgatissima Linnæus. Can. Ent., xxviii, 203.

Cerotoma Chevrolat.

trifurcata Fœrster. Coleop. Ind., 1163: Trans. Am. Ent. Soc., xx, 129: Rept. Conn. Agr. Expt. Sta., 1918, 327.

Trirhabda LeConte.

canadensis Kirby. Coleop. Ind., 1165.
virgata LeConte. *Ibid.*, 1166.

Agelasa Motschulsky.

halensis Linnæus. Coleop. Ind., 1164.

Galerucella Crotch.

americana Fabricius. Coleop. Ind., 1167.
cavicollis LeConte. *Ibid.*, 1169.
decora Say. *Ibid.*, 1170.
integra LeConte. *Ibid.*, 1167.
luteola Müller. Conn. Agr. Expt. Sta., Bull. 55 and Rept., 1908.
notata Fabricius. Coleop. Ind., 1168.
nymphææ Linnæus. *Ibid.*, 1169: Bur. Ent. Soc., Bull. 54, 58.

Monoxia LeConte.

puncticollis Say. *maritima.* Trans. Am. Ent. Soc., xx, 83.

Diabrotica Chevrolat.*

atripennis Say var. **cristata** Harris. Trans. Am. Ent. Soc., xx, 95.
atripennis var. **fossata** LeConte. *Ibid.*, xx, 95.
duodecimpunctata Olivier. *12-punctata.* Coleop. Ind., 1172: Rept. Conn. Agr. Expt. Sta., 1908, 809.
vittata Fabricius. Striped cucumber beetle. Coleop. Ind., 1173: Rept. Conn. Agr. Expt. Sta., 1908, 807: 1917, 262.

Phyllobrotica Redtenbacher.

discoidea Fabricius. Coleop. Ind., 1175.
limbata Fabricius. *Ibid.*, 1175. Trans. Am. Ent. Soc., xx, 100.

Luperodes Motschulsky.

meraca Say. Coleop. Ind., 1176.

Blepharida Rogers.

rhois Fœrster. Coleop. Ind., 1208.

Œdionychis Latreille.

fimbriata Fœrster. Coleop. Ind., 1183.
limbalis Melsheimer var. **subvittata** Horn. Trans. Am. Ent. Soc., xvi, 193.
miniata Fabricius. Coleop. Ind., 1183.
quercata Fabricius. *Ibid.*, 1185. (G.D.)
sexmaculata Illiger. *Ibid.*, 1184.
thoracica Fabricius. *Ibid.*, 1182.
vians Illiger. *Ibid.*, 1182.

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* See also appendix.

Disonycha Chevrolat.

caroliniana Fabricius. Coleop. Ind., 1188.
collata Fabricius. *Ibid.*, 1191. (G.D.)
funerea Randall. Trans. Am. Ent. Soc., xvi, 208.
pennsylvanica Illiger. Coleop. Ind., 1187.
quinquevittata Say. *Ibid.*, 1188.
triangularis Say. *Ibid.*, 190.
xanthomelæna Dalman. *collaris*. *Ibid.*, 1190. (G.D.)

Luperaltica Crotch.

fuscula LeConte. Coleop. Ind., 1203.

Altica Geoffroy.

bimarginata Say. Alder flea beetle. Coleop. Ind., 1201.
corni Woods. Me. Agr. Expt. Sta., Bull., 273, 156.
chalybea Illiger. Coleop. Ind., 1201.
fuscoænea Melsheimer. *Ibid.*, 1202. (G.D.)
ignita Illiger. *Ibid.*, 1201.
marevagans Horn. Trans. Am. Ent. Soc., xvi, 226.
rosæ Woods. Me. Agr. Expt. Sta., Bull. 273, 174.
rufa Illiger. Coleop. Ind., 1200.
torquata LeConte. Me. Agr. Expt. Sta., Bull. 273, 194.
ulmi Woods. *Ibid.*, Bull. 273, 182.

Crepidodera Chevrolat.

atriventris Melsheimer. Coleop. Ind., 1214. (G.D.)
helxines Linnæus. *Ibid.*, 1214.
modeeri Linnæus. *Ibid.*, 1214.

Epitrix Foudras.

cucumeris Harris. Cucumber flea beetle. Coleop. Ind., 1217
parvula Fabricius. *Ibid.*, 1218. (G.D.)

Orthaltica Crotch.

copalina Fabricius. Coleop. Ind., 1215.

Mantura Stephens.

floridana Crotch. Coleop. Ind., 1219. (G.D.)

Chætocnema Stephens.

confinis Crotch. Coleop. Ind., 1212.
denticulata Illiger. *Ibid.*, 1210.
minuta Melsheimer. *Ibid.*, 1210.
pulicaria Melsheimer. *Ibid.*, 1212.

Systena Clark.

frontalis Fabricius. Coleop. Ind., 1220.
hudsonias Fœrster. *Ibid.*, 1220.
marginalis Illiger. *Ibid.*, 1221.
tæniata Say. *Ibid.*, 1221.
tæniata var. **blanda** Melsheimer. *Ibid.*, 1221.

Longitarsus Latreille.

insolens Horn. Trans. Am. Ent. Soc., xvi, 286.
melanurus Melsheimer. Coleop. Ind., 1193.

Phyllotreta Foudras.

armoriaceæ Koch. Coleop. Ind., 1198.
bipustulata Fabricius. *Ibid.*, 1198.
chalybeipennis Crotch. Trans. Am. Ent. Soc., xvi, 300.
sinuata Stephens. Coleop. Ind., 1197.
vittata Fabricius. *Ibid.*, 1197.

Dibolia Chevrolat.

borealis Chevrolat. *ærea*. Coleop. Ind., 1222.

Psylliodes Latreille.

punctulata Melsheimer. Coleop. Ind., 1222.

Stenispa Baly.

metallica Fabricius. Coleop. Ind., 1228.

Anoplitis Chapuis.

nervosa Panzer. *Chalepus*. *Odontota*. Coleop. Ind., 1228.

Chalepus Thunberg.

bicolor Olivier. *Odontota*. Coleop. Ind., 1226.
dorsalis Thunberg. *Ibid.*, 1227.
hornii Smith. *Odontota*. *Ibid.*, 1227.
notata Olivier. *Odontota*. Trans. Am. Ent. Soc., x, 296.
scapularis Olivier. *Odontota*. Coleop. Ind., 1226.

Baliosus Weise.

rubra Weber. *Chalepus*. *Odontota*. Coleop. Ind., 1227.

Uroplata Baly.

porcata Melsheimer. Trans. Am. Ent. Soc., x, 294.

Microrhopala Chevrolat.

vittata Fabricius. Coleop. Ind., 1224.
xerene Newman. *Ibid.*, 1225.

Chelymorpha Chevrolat.

cassidea Fabricius. *argus*. Coleop. Ind., 1233.

Chirida Chapuis.

guttata Olivier. *Coptocycla. signifera*. Coleop. Ind., 1232.

Deloyala Chevrolat.

clavata Fabricius. *Coptocycla*. Coleop. Ind., 1232: Rept. Conn. Agr. Expt. Sta., 1918, 110.

Metriona Weise.

bicolor Fabricius. *Coptocycla. aurichalcea*. Coleop. Ind., 1231.
purpurata Boheman. *Coptocycla. Ibid.*, 1232. (K.F.C.)

Family MYLABRIDÆ.

(BRUCHIDÆ.)

Spermophagus Schonherr.

hoffmannseggi Gyllenhal. *robiniæ* Fabricius. Coleop. Ind., 1235.

Bruchus Linnæus.

calvus Horn. Coleop. Ind., 1239.
nigrinus Horn. Trans. Am. Ent. Soc., iv, 327.
obtectus Say. Bean weevil. Coleop. Ind., 1240.
pisorum Linnæus. Pea weevil. *Ibid.*, 1236.
quadrimaculatus Fabricius. Trans. Am. Ent. Soc., iv, 318.

Zabrotes Horn.

subnitens Horn. Trans. Am. Ent. Soc., xii, 158.

Family BRENTIDÆ.

Eupsalis LeConte.

minuta Drury. Oak timber worm. Ins. Aff. Park and Woodl. Trees, 261: Rhyn. N. E. Am., 20.

Family BELIDÆ.

Ithycerus Schonherr.

noveboracensis Fœrster. New York weevil. Rept. Conn. Agr. Expt. Sta., 1908, 845: Rhyn. N. E. Am., 92.

Family PLATYSTOMIDÆ.

(ANTHRIBIDÆ.)

Eurymycter LeConte.

fasciatus Olivier. Rhyn. N. E. Am., 30.

Euparius Schonherr.

marmoreus Olivier. *Cratoparis lunatus.* Rhyn. N. E. Am., 37; Ins. Aff. Park and Woodl. Trees, 499.

Brachytarsus Schonherr.

sticticus Boheman. *variegatus.* Rhy. N. E. Am., 39.
tomentosus Say. *Ibid.*, 40.

Anthribulus LeConte.

rotundatus LeConte. Rhyn. N. E. Am., 41.

Family CURCULIONIDÆ.

Auletes Schonherr.

albovestita Blatchley. Rhyn. N. E. Am., 54.
ater LeConte. *Ibid.*, 53.

Eugnamptus Schonherr.

angustatus Gyllenhal. Rhyn. N. E. Am., 56.
collaris Fabricius var. **nigripes** Melsheimer. *Ibid.*, 56.

Rhynchites Herbst.

æratus Say. Rhyn. N. E. Am., 59.
bicolor Fabricius. Rose weevil. *Ibid.*, 58.
hirtus Fabricius. *Ibid.*, 59.

Attelabus Linnæus.

analis Illiger. Rhyn. N. E. Am., 62.
bipustulatus Fabricius. *Ibid.*, 63. (A.B.C.) (H.B.K.)
nigripes LeConte. *Ibid.*, 62.
rhois Boheman. *Ibid.*, 64.

Pterocolus Schonherr.

ovatus Fabricius. Rhyn. N. E. Am., 65.

Apion Herbst.

coxale Fall. Rhyn. N. E. Am., 77.
griseum Smith. *Ibid.*, 80.
herculanum Smith. *Ibid.*, 89. (A.B.C.) (H.B.K.)
nigrum Herbst. *Ibid.*, 82.
patruele Smith. *Ibid.*, 78.
rostrum Say. *Ibid.*, 81.

Hormorus Horn.

undulatus Uhler. Rept. Conn. Agr. Expt. Sta., 1905, 259: Rhyn. N. E. Am., 100.

Panscopus Schonherr.

erinaceus Say. *Barynotus.* Rhyn. N. E. Am., 104.

Phylexis Schonherr.

rigidus Say. *Barynotus.* Rhyn. N. E. Am., 107.

Otiorhynchus Germar.

ovatus Linnæus. Strawberry crown girdler. Rept. Conn. Agr. Expt. Sta., 1909, 370: Rhyn. N. E. Am., 111.
sulcatus Fabricius. Rept. Conn. Agr. Expt. Sta., 1913, 230: Rhyn. N. E. Am., 111.

Pandeletejus Schonherr.

hilaris Herbst. Rhyn. N. E. Am., 120.

Aphrastus Schonherr.

tæniatus Gyllenhal. Rhyn. N. E. Am., 127.

Polydrusus Germar.

impressifrons Gyllenhal. Rhyn. N. E. Am., 130: N. Y. (Geneva) Agr. Expt. Sta., Tech. Bull. 56.

Scythropus Schonherr.

elegans Couper. Rhyn. N. E. Am., 131.

Barypeithes Duval.

pellucidus Boheman. Rhyn. N. E. Am., 133.

Sitona Schonherr.

flavescens Marsham. Rhyn. N. E. Am., 142.
hispidula Germar. *Ibid.*, 141.

Hypera Germar.

punctatus Fabricius. Clover leaf beetle. Ins. Ill., xxv, 83: Rhyn. N. E. Am., 146.

Phytonomus Schonherr.

meles Fabricius. Rhyn. N. E. Am., 150.
nigrirostris Fabricius. *Ibid.*, 150.
sp.

Listronotus Jekel.

inæqualipennis Boheman. Rhyn. N. E. Am., 156.
latiusculus Boheman. *Ibid.*, 161.
tuberosus LeConte. *Ibid.*, 154.

Hyperodes Jekel.

humilis Gyllenhal. Rhyn. N. E. Am., 176.
solutus Boheman. *Ibid.*, 166.
sp.

Pissodes Germar.

affinis Randall. Rhyn. N. E. Am., 183.
approximatus Hopkins. *Ibid.*, 181.
strobi Peck. White Pine Weevil. *Ibid.*, 180. Rept. Conn. Agr. Expt. Sta., 1919, 144.

Hylobius Germar.

pales Herbst. Proc. Am. Phil. Soc., xv, 140: Ryn. N. E. Am. 186.
confusus Kirby. Rhyn. N. E. Am., 187.

Dorytomus Stephens.

laticollis LeConte. Rhyn. N. E. Am., 195. (A.B.C.) (H.B.K.)
parvicollis Casey. *Ibid.*, 195.

Desmoris LeConte.

constrictus Say. Rhyn. N. E. Am., 206.

Smicronyx Schonherr.

corniculatus Fabricius. Rhyn N. E. Am., 211.

Brachybamus Germar.

electus Germar. Rhyn. N. E. Am., 222.

Endalus Laporte.

ovalis LeConte. Rhyn. N. E. Am., 224. (A.B.C.) (H.B.K.)

Onchylis LeConte.

nigrirostris Boheman. Rhyn. N. E. Am., 226.

Bagous Germar.

magister LeConte. Rhyn. N. E. Am., 231.
nebulosus LeConte. *Ibid.*, 237.
pauxillus Blatchley. *Ibid.*, 238.

Tychius Schonherr.

picirostris Fabricius. Rhyn. N. E. Am., 246.

Otidocephalus Chevrolat.

chevrolatii Horn. *myrmecodes.* Rhyn. N. E. Am., 251.
lævicollis Horn. *Ibid.*, 250.
myrmex Herbst. *myrmecodes* Say. *Ibid.*, 250.

Magdalis Germar.

alutacea LeConte. Rhyn. N. E. Am., 257.
armicollis Say. *Ibid.*, 258.
austera Fall var. **substrigata** Fall. *Ibid.*, 256.
barbita Say. *Ibid.*, 258.
olyra Herbst. Hickory snout borer. *Ibid*, 259.
salicis Horn. Rhyn. N. E. Am., 260. (A.B.C.) (H.B.K.)

Balaninus Germar.

algonquinus Casey. Lesser chestnut weevil. Rhyn. N. E. Am., 267.
baculi Chittenden. *uniformis. Ibid.*, 271.
caryæ Horn. Hickory nut weevil. *Ibid.*, 265.
confusor Hamilton. Confused acorn weevil. *Ibid.*, 270.
nasicus Say. Mottled acorn weevil. *Ibid.*, 269.
obtusus Blanchard. Hazelnut weevil. *Ibid.*, 272.
pardalis Chittenden. *Ibid.*, 270.
proboscideus Fabricius. Larger chestnut weevil. *Ibid.*, 264.
quercus Horn. Proc. Am. Phil. Soc., 1873, 458.
rectus Say. Common acorn weevil. Rhyn. N. E. Am., 266.

Orchestes Illiger.

canus Horn. Rhyn. N. E. Am., 281.
niger Horn. *Ibid.*, 280.
pallicornis Say. *Ibid.*, 280.
rufipes LeConte. *Ibid.*, 282.

Tachypterellus Cockerell.

quadrigibbus Say. *Anthonomus.* Apple curculio. Rhyn. N. E. Am., 285.

Anthonomopsis Dietz.

mixtus LeConte. Rhyn. N. E. Am., 286.

Anthonomus Germar.

elongatus LeConte. Rhyn. N. E. Am., 315.
musculus Say. *Ibid.*, 302. (A.B.C.) (H.B.K.)
nubilis LeConte. *Ibid.*, 314.
pusillus LeConte. *Ibid.*, 289.
scutellaris LeConte. *Ibid.*, 287.
scutellatus Gyllenhal. *Ibid.*, 307.
signatus Say. Strawberry weevil. *Ibid.*, 300.
suturalis LeConte. *Ibid.*, 297.

Prionomerus Schonherr.

calceatus Say. Rhyn. N. E. Am., 322.

Piazorhinus Schonherr.

scutellaris Say. Rhyn. N. E. Am., 323.

Gymnetron Schonherr.

teter Fabricius. Rhyn. N. E. Am., 326.

Miarus Stephens.

hispidulus LeConte. Rhyn. N. E. Am., 326.
puritanus Casey. *Ibid.*, 327.

Stephanocleonus Motschulsky.

plumbeus LeConte. Rhyn. N. E. Am., 328.

Cleonus Schonherr.

calandroides Randall. Rhyn. N. E. Am., 330.

Lixus Fabricius.

concavus Say. Rhubarb weevil or curculio. Rhyn. N. E. Am., 337.
musculus Say. *Ibid.*, 336. (G.D.)
rubellus Randall. *Ibid.*, 334.

Læmosaccus Schonherr.

plagiatus Say. Rhyn. N. E. Am., 346. (A.B.C.) (H.B.K.)

Baris Germar.

scolopacea Germar. Rhyn. N. E. Am., 357.
umbilicata LeConte. *Ibid.*, 350.

Onychobaris LeConte.

pectorosa LeConte. Rhyn. N. E. Am., 366.

Note: — **Diorymellus laevimargo** Champion, a small black weevil, infests orchids in greenhouses.

Madarellus Casey.

undulatus Say. Rhyn. N. E. Am., 367.

Pseudobaris LeConte.

nigrina Say. Rhyn. N. E. Am., 374.

Centrinus Schonherr.

perscitus Herbst. Rhyn. N. E. Am., 383.
picumnus Herbst. *Ibid.*, 380.

Odontocorynus Schonherr.

salebrosus Casey. Rhyn. N. E. Am., 386.
scutellum-album Say. *Ibid.*, 385.

Nicentrus Casey.

linecollis Boheman. *Centrinus.* Rhyn. N. E. Am., 390.

Idiostethus Casey.

subcalvus LeConte. Rhyn. N. E. Am., 404.
tubulatus Say. *Stethobaris.* *Ibid.*, 404.

Stethobaris LeConte.

ovata LeConte. Rhyn. N. E. Am., 407.

Cylindrocopturus Heller.

binotatus LeConte. *Copturodes. Copturus.* Rhyn. N. E. Am., 420.
quercus Say. *Copturodes. Copturus.* *Ibid.*, 421.

Acoptus LeConte.

suturalis LeConte. Rhyn. N. E. Am., 423. (A.B.C.) (H.B.K.)

Mononychus Germar.

vulpeculus Fabricius. Rhyn. N. E. Am., 426.

Acanthoscelis Dietz.*

acephalus Say. *Falciger. Cœliodes.* Rhyn. N. E. Am., 431.

Auleutes Dietz.

asper LeConte. Rhyn. N. E. Am., 432. (C.W.L.)
nebulosus LeConte. *Ibid.*, 435.
tenuipes LeConte. *Ibid.*, 433.

Acallodes LeConte.

ventricosus LeConte. Rhyn. N. E. Am., 437.

Cœliodes Schonherr.

acephalus Say. Proc. Am. Phil. Soc., xv, 269.
flavicaudis Boheman. Rhyn. N. E. Am., 438.

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* See also appendix.

Ceutorhynchus Germar.*

rapæ Gyllenhal. *affluentus*. Rhyn. N. E. Am., 442.
septentrionalis Gyllenhal. *Ibid.*, 452.

Cœlogaster Schonherr.

zimmermanni Gyllenhal. Rhyn. N. E. Am., 455.

Pelenomus Thomson.

sulcicollis Fabricius. Rhyn. N. E. Am., 457.

Rhinonchus Schonherr.

pyrrhopus Boheman. Rhyn N. E. Am., 461.

Conotrachelus Schonherr.

albicinctus LeConte. Rhyn. N. E. Am., 469. (A.B.C.) (H.B.K.)
anaglypticus Say. *Ibid.*, 480.
aratus Germar. *Ibid.*, 473.
cratægi Walsh. Quince curculio. *Ibid.*, 474: Cornell Agr. Expt. Sta., Bull. 148.
elegans Say. Rhyn. N. E. Am., 472.
geminatus LeConte. *Ibid.*, 478.
juglandis LeConte. Walnut curculio. *Ibid.*, 468: Rept. Conn. Agr. Expt. Sta., 1912, 240.
nenuphar Herbst. Plum curculio. Rhyn. N. E. Am., 469: Rept. Conn. Agr. Expt. Sta., 1904. 219.
posticatus Boheman. Rhyn. N. E. Am., 477.
seniculus LeConte. *Ibid.*, 472. (A.B.C.) (H.B.K.)

Ryssematus Chevrolat.

æqualis Horn. Rhyn. N. E. Am., 484.
lineaticollis Say. *Ibid.*, 484.

Tyloderma Say.

ærea Say. Rhyn. N. E. Am., 493.
foveolata Say. *Ibid.*, 491.
nigra Casey. *Ibid.*, 493.
punctata Casey. *Ibid.*, 494.

Apteromechus Faust.

ferratus Say. Rhyn. N. E. Am., 506.

Cryptorhynchus Illiger.

bisignatus Say. *Eubulus*. Rhyn. N. E. Am., 509.
fuscatus LeConte. *Ibid.*, 509.
lapathi Linnæus. Poplar or willow curculio. *Ibid.*, 510.
parochus Herbst. *Ibid.*, 508.
tristis LeConte. *Ibid.*, 514. (A.B.C.)

* See also appendix.

Dryophthorus Schonherr.

americanus Bedel. *corticalis*. Rhyn. N. E. Am., 524.

Himatinum Cockerell.

conicum LeConte. *Himatium*. Rhyn. N. E. Am., 527. (C.C.)

Cossonus Clairville.

concinnus Boheman. Rhyn. N. E. Am., 531. (G.D.)
corticola Say. *Ibid.*, 532.
impressifrons Boheman. *Ibid.*, 531. (H.L.J.)
platalea Say. *Ibid.*, 530.

Stenoscelis Wollaston.

brevis Boheman. Rhyn. N. E. Am., 545.

Rhodobænus LeConte.

tredecimpunctatus Illiger. Rhyn. N. E. Am., 550.

Sphenophorus Schonherr.

æqualis Gyllenhal. Rhyn. N. E. Am., 553.
callosus Olivier. *sculptilis*. *Ibid.*, 567.
parvulus Gyllenhal. *Ibid.*, 563.
pertinax Olivier. *Ibid.*, 556.
setiger Chittenden. *Ibid.*, 557.
venatus Say. *placidus*. *Ibid.*, 571.
zeæ Walsh. *Ibid.*, 566.

Calendra Clairville.

granaria Linnæus. Grain weevil. Rhyn. N. E. Am., 574.
oryzæ Linnæus. Rice weevil. *Ibid.*, 575.

Family SCOLYTIDÆ.

Scolytus Geoffroy.

Eccoptogaster.

quadrispinosus Say. Hickory bark beetle. Can. Bark Beetles, ii, 52.
rugulosus Ratzeburg. Fruit bark beetle. Shot-hole borer. *Ibid.*, 52.

Chramesus LeConte.

icoriæ LeConte. Hickory twig borer. Can. Bark Beetles, ii, 58.

Phthorophlœus Rey.

frontalis Zimmerman. Can. Bark Beetles, ii, 59.

Dendroctonus Erichson.

terebrans Olivier. Turpentine bark beetle. Can. Bark Beetles, ii, 64.

valens LeConte. *Ibid.*, 63.

Phlœosinus Chapuis.

dentatus Say. Red cedar bark beetle. Can. Bark Beetles, ii, 68.

Leperisinus Reitter.

aculeatus Say. *Hylesinus.* Ash timber beetle. Can. Bark Beetles, ii, 72.

Hylastinus Bedel.

obscurus Marsham. Can. Bark Beetles, ii, 73.

Hylurgopinus Swaine.

rufipes Eichhoff. *Hylastes.* Can. Bark Beetles, ii, 74.

Hylurgops LeConte.

pinifex Fitch. *Hylastes.* Can. Bark Beetles, ii, 81.

Micracis LeConte.

suturalis LeConte. Rhyn. N. E. Am., 647.

Ptercyclon Eichhoff.

Monarthrum.

fasciatum Say. Can. Bark Beetles, ii, 86.

mali Fitch. *Ibid.*, 87.

Hypothenemus Westwood.

hispidulus LeConte. Rhyn. N. E. Am., 596.

Stephanoderes Eichhoff.

dissimilis Zimmerman. Rhyn. N. E. Am., 603.

sp.

Pityophthorus Eichhoff.

canadensis Swaine. Can. Bark Beetles, ii, 97.

puberulus LeConte. *Ibid.*, 95.

pulicarius Zimmerman. *Ibid.*, 95.

sp.

sp.

Pityogenes Bedel.

hopkinsi Swaine. Can. Bark Beetles, ii, 106.

Ips DeGeer.

grandicollis Eichhoff. Can. Bark Beetles, ii, 113.
pini Say. *Ibid.*, 115.
sp.

Orthotomicus Ferrari.

cælatus Eichhoff. *Tomicus. Xyleborus.* Can. Bark Beetles, ii, 121.

Pityokteines Fuchs.

sparsus LeConte. *Xyleborus. Tomicus. Pityogenes.* Can. Bark Beetles, ii, 123.

Anisandrus Ferrari.

pyri Peck. *Xyleborus dispar.* Can. Bark Beetles, ii, 124.
sp.

Xyleborus Eichhoff.

celsus Eichhoff. Hickory timber beetle. Can. Bark Beetles, ii, 126.

Order **STREPSIPTERA.***

Family STYLOPIDÆ.

Stylops Kirby.

vicinæ Pierce. U. S. Nat. Mus., Bull. No. 66, 110.

Family XENIDÆ.

Acroschismus Pierce.

wheeleri Pierce. *Xenos peckii* Brues. U. S. Nat. Mus., Bull. No. 66, 129.

Schistosiphon Pierce.

peckii Kirby. *Xenos.* U. S. Nat. Mus., Bull No. 66, 133.

* This order has usually been included in the Coleoptera, and is therefore not given in the table for the separation of the orders, Bulletin 16, page 34.

Order **HYMENOPTERA.**

Ants, bees, wasps, etc.

Suborder **PHYTOPHAGA.**

Family XYELIDÆ.

Macroxyela Kirby.

infuscata Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 32.

Family PAMPHILIIDÆ.

Itycorsia Konow.

albomarginata Cresson. *Lyda.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 35.
angulata MacGillivray. *Ibid.,* Bull. 22, 34. (A.B.C.)
luteomaculata Cresson. *Ibid.,* Bull. 22, 35, (R.H.)
ochrocera Norton. *Ibid.,* Bull. 22, 34.
zappei Rohwer. Proc. U. S. Nat. Mus., 57, 209.

Cænolyda Konow.

semidea Cresson. *Lyda.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 36.

Neurotoma Konow.

fasciata Norton. *Lyda.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 35. (E.N.)

Pamphilius Latreille.

dentatus MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 38.
ocreatus Say. *Lyda. Ibid.,* Bull. 22, 37.
persicus MacGillivray. Peach sawfly. *Ibid.,* Bull. 22, 38: Rept. Conn. Agr. Expt. Sta., 1907, 285.
rileyi Cresson. Trans. Am. Ent. Soc., viii, 32.

Anoplolyda Costa.

luteicornis Norton. *Lyda.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 40. (E.N.)
pallimacula Norton. *Lyda. Ibid.,* Bull. 22, 40. (E.N.)
rufofasciatus Norton. *Lyda. Ibid.,* Bull. 22, 41. (E.N.)
scripta Say. *Lyda. Ibid.,* Bull. 22, 40.

Family TENTHREDINIDÆ.*

Diprion Schrank.

simile Hartig. *Lophyrus.* Jour. Econ. Ent., viii, 379: Conn. Geol. Nat. Hist. Surv., Bull. 22, 761.

Neodiprion Rohwer.

abietis Harris. *Lophyrus.* Conn. Geol. Nat. Hist. Surv., Bull 22, 44.
lecontei Fitch. *Lophyrus.* *Ibid.,* Bull. 22, 44.
pinetum Norton. *abbotti.* *Lophyrus.* *Ibid.,* Bull., 22, 44.
pinus-rigida Norton. *Lophyrus.* *Ibid.,* Bull. 22, 44.
sp.
sp.

Hemitaxonus Ashmead.

dubitatus Norton. *Taxonus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 46.

Epitaxonus MacGillivray.

albidopictus Norton. *Taxonus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 46.

Taxonus Hartig.

nigrisomus Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 47.

Monostegia Costa.

martini MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 47.

Empria LePeletier.

Pœcilostoma Dahlbom.

calda MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 51.
candidula MacGillivray. *Ibid.,* Bull. 22, 54.
cariosa MacGillivray. *Ibid.,* Bull. 22, 54.
casca MacGillivray. *Ibid.,* Bull. 22, 53.
casta MacGillivray. *Ibid.,* Bull. 22, 52.
costata MacGillivray. *Ibid.,* Bull. 22, 51.
evecta MacGillivray. *Ibid.,* Bull. 22, 54.
ignota Norton. *Monostegia.* *Ibid.,* Bull. 22, 53.
maculata Norton. *Harpiphorus.* *Ibid.,* Bull. 22, 53.
sp.

* See also appendix.

Emphytus Klug.

apertus Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 56.
cinctipes Norton. *Ibid.*, Bull. 22, 56.
gillettii Mac Gillivray. *Ibid.*, Bull. 22, 57.
inornatus Say. *Ibid.*, Bull. 22, 56.
mellipes Norton. *Ibid.*, Bull. 22, 56.

Emphytina Rohwer.

vanduzeei Rohwer. Proc. U. S. Nat. Mus., 49, 205.

Parataxonus MacGillivray.

erythrogastra Rohwer. Proc. U. S. Nat. Mus., 41, 408.
multicolor Norton. *Taxonus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 57.

Eriocampa Hartig.

rotunda Norton. *Sciapteryx.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 58.

Monosoma MacGillivray.

inferentia Norton. *Pœcilostoma.* Conn. Geol Nat. Hist. Surv., Bull. 22, 59.

Macremphytus MacGillivray.

semicornis Say. *Emphytus. Harpiphorus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 59.
tarsatus Say. *Emphytus. Harpiphorus. Ibid.*, Bull. 22, 61.
varianus Norton. *Emphytus. Harpiphorus. Ibid.*, Bull. 22, 60.

Strongylogastroidea Ashmead.

apicalis Norton. *Allantus. Strongylogaster.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 63.
epicera Say. *Allantus. Strongylogaster. Ibid.*, Bull. 22, 63.
mellosa Norton. *Allantus. Strongylogaster. Ibid.*, Bull. 22, 62.
rufocincta Norton. *Allantus. Strongylogaster. Ibid.*, Bull. 22, 63.
terminalis Say. *Allantus. Strongylogaster. Ibid.*, Bull. 22, 62.
unicincta Norton. *Taxonus. Ibid.*, Bull. 22, 64 (E.N.)

Dimorphopteryx Ashmead.

pinguis Norton. *Strongylogaster.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 64.

Selandria Leach.

flavipes Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 66.

Thrinax Konow.

impressatus Provancher. *Strongylogaster.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 67.

Strongylogaster Dahlbom.

annulosus Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 68.
longulus Norton. *Ibid.*, Bull. 22, 67.
luctuosus Provancher. Trans. Am. Ent. Soc., xxii, 310.
tacitus Say. *Allantus*. Conn. Geol. Nat. Hist. Surv., Bull. 22, 68.
sp.

Dolerus Jurine.

abdominalis Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 74.
apricus Norton. *Ibid.*, Bull. 22, 72.
aprilis Norton. *Ibid.*, Bull. 22, 74.
bicolor Beauvois. *Ibid.*, Bull. 22, 72.
collaris Say. *Ibid.*, Bull. 22, 73. (A.B.C.)
colosericeus MacGillivray. *Ibid.*, Bull. 22, 70.
conjugatus MacGillivray. *Ibid.*, Bull. 22, 73.
dysporus MacGillivray. *Ibid.*, Bull. 22, 73.
inspiratus MacGillivray. *Ibid.*, Bull. 22, 72.
luctatus MacGillivray. Can. Ent., xl, 127.
monosericeus MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 70.
refugus MacGillivray. *Ibid.*, Bull. 22, 71.
sericeus Say. *Ibid.*, Bull. 22, 69.
similis Norton. *Ibid.*, Bull. 22, 74. (E.N.)
tectus MacGillivray. *Ibid.*, Bull. 22, 70.
unicolor Beauvois. *Ibid.*, Bull. 22, 73.
versus Norton. *Ibid.*, Bull. 22, 75. (A.E.V.)
sp.

Loderus Konow.

albifrons Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 76.

Endelomyia Ashmead.

æthiops Fabricius. *Caliroa. Monostegia rosæ.* **Rose sawfly.** Conn. Geol. Nat. Hist. Surv., Bull. 22, 77.

Caliroa Costa.

cerasi Linnæus. *Eriocampoides limacina.* **Pear and cherry slug.** Conn. Geol. Nat. Hist. Surv., Bull. 22, 77.
fasciata Norton. *Ibid.*, Bull. 22, 79.
obsoleta Norton. *Ibid.*, Bull. 22, 78.
quercus-alba Norton. *Ibid.*, Bull. 22, 78. (E.N.)

Pachyprotasis Hartig.

rapæ Linnæus. *omega*. Conn. Geol. Nat. Hist. Surv., Bull. 22, 81. (E.N.)

Lagium Konow.

atroviolaceum Norton. *Tenthredopsis*. Conn. Geol. Nat. Hist. Surv., Bull. 22, 81.

atroviolaceum var. **tardum** Norton. *Ibid.*, Bull. 22, 81.

cinctulum Norton. *Ibid.*, Bull. 22, 81.

Tenthredopsis Costa.

semilutea Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 82. (E. N.)

Rhogogastera Konow.

evansii Harrington. Conn. Geol. Nat. Hist. Surv., Bull. 22, 83.

Tenthredo Linnæus.

angulifera Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 88. (E.N.)

flavomarginis Norton. *Ibid.*, Bull. 22, 90. (E.N.)

grandis Norton. *Ibid.*, Bull. 22, 84. (E.N.)

formosa Norton. *Ibid.*, Bull. 22, 87.

lobata Norton. *Ibid.*, Bull. 22, 88.

lobata var. **maculosa** Smulyan. Can. Ent., xlvii, 324. (W.E.B.)

rufipes Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 91. (A.B.C.)

rufopecta Norton. *Ibid.*, Bull. 22, 86.

verticalis Say. *Ibid.*, Bull. 22, 86.

sp.

Macrophya Dahlbom.

alba MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 94. (A.B.C.)

albomaculata Norton. *Ibid.*, Bull 22, 97. (E.N.)

bilineata MacGillivray. *Ibid.*, Bull. 22, 96.

cassandra Kirby. List. Hym. Brit. Mus., i, 273, pl. 10, fig. 13.

epinota Say. *Ibid.*, Bull 22, 93.

externa Say. *Ibid.*, Bull. 22, 96.

externiformis Rohwer. Proc. U. S. Nat. Mus., 43, 220.

fascialis Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 99.

flavicoxa Norton. *Ibid.*, Bull. 22, 95.

formosa Klug. *Ibid.*, Bull., 22, 98.

fuliginea Norton. *Ibid.*, Bull. 22, 96.
goniphora Say. *Ibid.*, Bull. 22, 98.
incerta Norton. *Ibid.*, Bull. 22, 96 (E. N.)
intermedia Norton. *Ibid.*, Bull. 22, 98. (E.N.)
lineata Norton. *Ibid.*, Bull. 22, 95.
minuta MacGillivray. *Ibid.*, Bull. 22, 97.
nigra Norton. *Ibid.*, Bull. 22, 97.
pannosa Say. *Ibid.*, Bull. 22, 95.
proximata Norton. *Ibid.*, Bull. 22, 95. (E.N.)
pulchella Klug. *Ibid.*, Bull. 22, 94. (E.N.)
succincta Cresson. *Ibid.*, Bull. 22, 98.
tibiator Norton. *Ibid.*, Bull. 22, 96.
trisyllaba Say. *Ibid.*, Bull. 22, 98.
trosula Norton. *Ibid.*, Bull. 22, 93.
varia Norton. *Ibid.*, Bull. 22, 99. (E.N.)
zabriskei Rohwer. Proc. U. S. Nat. Mus., 43, 218.

Allantus Jurine.

basilaris Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 101.
dubius Norton. *Ibid.*, Bull. 22, 102.

Abia Leach.

inflata Norton. *Zaræa.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 102.

Trichiosoma Leach.

crassum Kirby. Conn. Geol. Nat. Hist. Surv., Bull. 22, 103. (A.B.C.)
triangulum Kirby. *Ibid.*, Bull. 22, 103.

Cimbex Olivier.

americana Leach. Conn. Geol. Nat. Hist. Surv., Bull. 22, 104.
americana var. **decimaculata** Norton. *Ibid.*, Bull. 22, 104.
americana var. **laportei** LePeletier. *Ibid.*, Bull. 22, 104.
americana var. **nortoni** MacGillivray. *Ibid.*, Bull. 22, 104.

Hoplocampa Hartig.

halcyon Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 105. (A.B.C.)

Caterocercus Rohwer.

quercivorus Rohwer. Proc. Wash. Ent. Soc., 20, 164.

Mesoneura Hartig.

parva Norton. *Dineura.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 107. (E.N.)

Priophorus Dahlbom.

acericaulis MacGillivray. Maple leaf stem borer. Ent. News, xvii, 313; Conn. Geol. Nat. Hist. Surv., Bull. 22, 109.
æqualis Norton. *Cladius.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 109. (E.N.)
simplicicornis Norton. *Ibid.*, Bull. 22, 109.

Cladius Illiger.

pectinicornis Fourcroy. *isomerus.* Bristly rose slug. Conn. Geol. Nat. Hist. Surv., Bull. 22, 110.

Trichiocampus Hartig.

viminalis Fallen. Conn. Geol. Nat. Hist. Surv., Bull. 22, 110.

Diphadnus Hartig.

appendiculatus Hartig. *Pristiphora grossularia.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 112.
californicus Marlatt. *Ibid.*, Bull. 22, 113.
proximatus Norton. *Nematus. Ibid.*, Bull. 22, 113.

Pristiphora Latreille.

betulavora Rohwer. Proc. U. S. Nat. Hist. Mus., 57, 219.
bivittata Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 114.
luteola Norton. *Ibid.*, Bull. 22, 114.
sycophanta Walsh. *tibialis. Ibid.*, Bull. 22, 113.

Lygæonematus Konow.

erichsoni Hartig. Larch sawfly. Conn. Geol. Nat. Hist. Surv., Bull. 22, 115.

Pachynematus Konow.

affinis Marlatt. Conn. Geol. Nat. Hist. Surv., Bull. 22, 117.
corniger Norton. *Ibid.*, Bull. 22, 118.
extensicornis Norton. *Ibid.*, Bull. 22, 116.
nigritus Norton. *Ibid.*, Bull. 22, 111. (E.N.)
rufocinctus MacGillivray. *Ibid.*, Bull. 22, 117. (A.B.C.)
subalbatus Norton. *Ibid.*, Bull. 22, 118.
sp.
sp.

Nematus Jurine.

chloreus Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 121. (E.N.)
longicornis Say. *longulicornis* Norton. (*Pteronus?*) *Ibid.*, Bull. 22, 111. (E.N.)

Crœsus Leach.

latitarsus Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 121.

Amauronematus Konow.

concolor Norton. *Nematus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 122. (E.N.)
semirufus Kirby. *fulvipes* Norton. *Nematus. Ibid.,* Bull. 22, 123. (E.N.)
luteotergum Norton. *Nematus. Ibid.,* Bull. 22, 123. (E.N.)
sp.

Pteronidea Rohwer.*

amelanchieridis Rohwer. Proc. U. S. Nat. Mus., 57, 215.
carpini Marlatt. Conn. Geol. Nat. Hist. Surv., Bull. 22, 129. (C.R.E.)
corylus Cresson. *Ibid.,* Bull. 22, 127. (C.R.E.)
integra Say. *Nematus integer. Ibid.,* Bull. 22, 131.
limbata Cresson. *Ibid.,* Bull. 22, 125.
longicornis Marlatt. *Ibid.,* Bull. 22, 132.
mendica Walsh. *Ibid.,* Bull. 22, 131.
populi Marlatt. *Ibid.,* Bull. 22, 128. (A.B.C.)
ribesi Scopoli. *Nematus ventricosus.* Currant worm. *Ibid.,* Bull. 22, 128.
thoracica Harrington. *Ibid.,* Bull. 22, 129.
trilineata Norton. *Ibid.,* Bull. 22, 130.
ventralis Say. *Ibid.,* Bull. 22, 133.
vertebrata Say. *Ibid.,* Bull. 22, 131.
sp.

Pontania Costa.

desmodioides Walsh. Conn. Geol. Nat. Hist. Surv., Bull. 22, 140.
hyalina Norton. *Ibid.,* Bull. 22, 137.
pisum Walsh. *Ibid.,* Bull. 22, 139. (A.B.C.)

Euura Newman.

orbitalis Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 141.
salicicola Smith. *Ibid.,* Bull. 22, 141.

Hypargyricus MacGillivray.

fumipennis Norton. *Monophadnus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 145.

* See also appendix.

Isodyctium Ashmead.

atratum MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 146.

caryicola Dyar. *Ibid.*, Bull. 22, 145.

Periclista Konow.

plesia Rohwer. Proc. U. S. Nat. Mus. 57, 211.

Tomostethus Konow.

bardus Say. *Sclandria.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 148.

inhabilis Norton. *Selandria. Ibid.*, Bull. 22, 148.

Monophadnus Hartig.

bipunctatus MacGillivray. Conn. Geol. Nat. Hist., Surv., Bull. 22, 149.

tiliæ Norton. *Selandria.* Ibid., Bull. 22, 149. (E.N.)

Paracharactus MacGillivray.

rudis Norton. *Selandria.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 150. (E.N.)

Phymatocera Dahlbom.

rufula Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 150.

Monophadnoides Ashmead.

collaris MacGillivray. Conn. Geol. Nat. Hist. Surv., Bull. 22, 152.

consobrinus MacGillivray. *Ibid.*, Bull. 22, 152.

coracinus MacGillivray. *Ibid.*, Bull. 22, 152.

rubi Harris. *Selandria. Ibid.*, Bull. 22, 151.

Aphanisus MacGillivray.

odoratus MacGillivray. Conn. Geol. Nat. Hist., Surv., Bull. 22, 154.

Blennocampa Hartig.

sp.

Erythraspides Ashmead.

caryæ Norton. *Selandria.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 156.

pygmæus Say. *Selandria vitis. Ibid.*, Bull. 22, 156.

Metallus Forbes.

rubi Forbes. Conn. Geol. Nat. Hist. Surv., Bull. 22, 160. (H.L.V.)

Atomacera Say.

debilis Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 160.
decepta Rohwer. Proc. U. S. Nat. Mus., 41, 382.
ruficollis Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 160.

Arge Schrank.
Hylotoma Latreille.

abdominalis Leach. Conn. Geol. Nat. Hist. Surv., Bull. 22, 161.
clavicornis Fabricius. *Ibid.*, Bull. 22, 161.
dulciaria Say. *Ibid.*, Bull. 22, 161.
erythrosoma Leach. Trans. Am. Ent. Soc., i, 72.
humeralis Beauvois. Conn. Geol. Nat. Hist. Surv., Bull. 22, 162.
macleayi Leach. *Ibid.*, Bull. 22, 161.
rubiginosa Beauvois. *Ibid.*, Bull. 22, 162.
rubra Klug. *Ibid.*, Bull. 22, 163. (J.A.H.)
salicis Rohwer. *Hylotoma pectoralis.* Proc. U. S. Nat. Mus., 43, 206.
scapularis Klug. Conn. Geol. Nat. Hist. Surv., Bull. 22, 162.
sphinx Kirby. *Ibid.*, Bull. 22, 162.
virescens Klug. *Ibid.*, Bull. 22, 161.
xanthothorax Leach. List. Hym. Brit. Mus., 1, 69, pl. 6, fig. 1.
sp.
sp.

Sterictiphora Billberg.

johnsoni MacGillivray. Can. Ent., xl, 403.

Schizocerus LePeletier.

privatus Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 164. (J.A.H.)
zabriskei Ashmead. *Ibid.*, Bull. 22, 164.

Acordulecera Say.

dorsalis Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 166. (E.N.)
maura MacGillivray. *Ibid.*, Bull. 22, 166. (H.L.V.)
media MacGillivray. *Ibid.*, Bull. 22, 165.
mixta MacGillivray. *Ibid.*, Bull. 22, 166.
saginata Provancher. *Ibid.*, Bull. 22, 167.
sp.
sp.

Family XIPHYDRIIDÆ.

Xiphydria Latreille.

attenuata Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 168. (W.H.P.)

maculata Say. *Ibid.*, Bull. 22, 168.

Family SIRICIDÆ.

Sirex Linnæus.

cyaneus Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. 22, 170. (E.N.)

Urocerus Geoffroy.

albicornis Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. 22, 171.

cressoni Norton. *Ibid.*, Bull. 22, 171.

flavicornis Fabricius. *Ibid.*, Bull. 22, 171.

Tremex Jurine.

columba Linnæus. Pigeon horn-tail. Conn. Geol. Nat. Hist. Surv., Bull. 22, 172.

Family CEPHIDÆ.

Janus Stephens.

abbreviatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 173.

bimaculatus Norton. *Cephus. Phyllœcus. Ibid.*, Bull. 22, 173.

integer Norton. *flaviventris.* Currant stem girdler. *Ibid.*, Bull. 22, 173.

Adirus Konow.

trimaculatus Say. *Phyllœcus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 173. (E.N.)

Family ORYSSIDÆ.

Oryssus Latreille.

sayi Westwood. Conn. Geol. Nat. Hist. Surv., Bull. 22, 175.

sayi var. **terminalis** Newman. *Ibid.*, Bull. 22, 175.

Suborder **HETEROPHAGA.**

Family VIPIONIDÆ.

Opius Wesmael.

exareolatus Viereck. Conn. Geol. Nat. Hist Surv., Bull. 22. 183.
novæangliæ Viereck. *Ibid.*, Bull. 22, 183.
pequodorum Viereck. *Ibid.*, Bull. 22, 183.

Cardiochiles Nees.

viator Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 183. (A.B.C.)

Apanteles Fœrster.

agricola Viereck. **(Protapanteles).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 186.
algonquinorum Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 188.
augustus Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 187.
cacæciæ Riley. Trans. St. Louis Acad. Sci., iv, pt. 2, 306.
carpatus Say. **(Apanteles).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 191.
clisiocampæ Ashmead. N. H. Agr. Expt. Sta., Tech. Bull. 6, 229.
conanchetorum Viereck. **(Apanteles).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 191.
congregatus Say. **(Protapanteles).** *Ibid.*, Bull. 22, 188.
flaviconche Riley. **(Protapanteles).** *Ibid.*, Bull. 22, 186.
forbesi Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 191.
gelechiæ Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 190.
hesperidivorus Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 187.
housatannuckorum Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 189.
hyphantriæ Riley. *Ibid.*, Bull. 22, 193.
lacteicolor Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 191.
læviceps Ashmead. **(Protapanteles).** *Ibid.*, Bull. 22, 188.
lanificus Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 188.
limenitidis Riley. **(Protapanteles).** *Ibid.*, Bull. 22, 186.
limenitidis var. **(Protapanteles).** *Ibid.*, Bull. 22, 187.
lunatus (Packard) Weed. **(Protapanteles).** *Ibid.*, Bull. 22, 186.
maquinnai Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 190.
melanopus Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 190.
miantonomoi Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 190.
militaris Walsh. **(Protapanteles).** *Ibid.*, Bull. 22, 189.
nemoriæ Ashmead. **(Protapanteles).** *Ibid.*, Bull. 22, 186.

ninigretorum Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 191.
nipmuckorum Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 191.
obscuricornis Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 186.
oxyacanthoidis Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 187.
pequodorum Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 190.
podunkorum Viereck. **(Stenopleura).** *Ibid.*, Bull. 22, 188. (D.J.C.)
pyraustæ Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 188.
radiatus Ashmead. **(Protapanteles).** *Ibid.*, Bull. 22, 189.
recurvariæ Ashmead. **(Apanteles).** *Ibid.*, Bull. 22, 191.
tischeriæ Viereck. *Ibid.*, Bull. 22, 191.
trachynotus Viereck. **(Apanteles).** *Ibid.*, Bull. 22, 191.
winkleyi Viereck. **(Protapanteles).** *Ibid.*, Bull. 22, 186.

Microgaster Latreille.

brittoni Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 201.
congregatiformis Viereck. *Ibid.*, Bull. 22, 201.
gelechiæ Riley. *Ibid.*, Bull. 22, 201.
solidaginis Viereck. *Ibid.*, Bull. 22, 201.
sp.

Microplitis Fœrster.

melianæ Viereck var. Conn. Geol. Nat. Hist. Surv., Bull. 22, 203.
quintilis Viereck. *Ibid.*, Bull. 22, 203.
varicolor Viereck. *Ibid.*, Bull. 22, 203.
waldeni Viereck. *Ibid.*, Bull. 22, 203.

Microbracon Ashmead.

connecticutorum Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 205.
dorsator Say var. **æqualis** Provancher. *Ibid.*, Bull. 22, 206.
dorsator var. **mellitor** Say. *Ibid.*, Bull. 22, 205.
hobomok Viereck. *Ibid.*, Bull. 22, 206.
konkapoti Viereck. *Ibid.*, Bull. 22, 205.
massasoit Viereck. *Ibid.*, Bull. 22, 205.
matacomet Viereck. *Ibid.*, Bull. 22, 206.
montowesei Viereck. *Ibid.*, Bull. 22, 206.
nanus Provancher. Faun. Ent. Can. Hym., 504.
nawaasorum Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 205.
podunkorum Viereck. *Ibid.*, Bull. 22, 205.

quinnipiacorum Viereck. *Ibid.*, Bull. 22, 205.
sanninoideæ Gahan. Proc. U. S. Nat. Mus., liii, 196.
scanticorum Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 205.
sebequanash Viereck. *Ibid.*, Bull. 22, 204.
uncas Viereck. *Ibid.*, Bull. 22, 206.
wawequa Viereck. *Ibid.*, Bull. 22, 204.

Habrobracon (Ashmead) W. J. Johnson.

gelechiæ Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 209.

Habrobraconidea Viereck.

bicoloripes Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 764.

Iphiaulax Fœrster.

augustus Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 210.
eurygaster Brullé. *Ibid.*, Bull. 22, 210.

Cœloides Wesmæl.

pissodis Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 210.

Atanycolus Fœrster.

simplex Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 210.

Family ALYSIIDÆ.

Cœlinidea Viereck.

occom Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 212.

Ericœlinius Viereck.

mahackemoi Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 212.

Dacnusa Haliday.

sachemella Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 213.

Pentapleura Fœrster.

foveolata Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 213.

Aspilota Fœrster.

ephemera Viereck. Conn. Geol. Nat. Hist. Surv., Bull., 22, 213.

Asobara Fœrster.

lineata Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 213.

Aphæreta Fœrster.

muscæ Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 214.

Synaldis Fœrster.

incisa Gahan. Conn. Geol. Nat. Hist. Surv., Bull. 22, 214.
pygmæa Viereck. *Ibid.*, Bull. 22, 215.
quinnipiacorum Viereck. *Ibid.*, Bull. 22, 215.

Family BANCHIDÆ.

Banchus Fabricius.

ferrugineus Provancher. Conn. Geol. Nat. Hist. Surv., Bull. 22, 216.
pallescens Provancher. *Ibid.*, Bull. 22, 216.

Family BRACONIDÆ.

Macrocentrus Curtis.

cerasivorana Viereck. Proc. U. S. Nat. Mus., 42, 623.
delicatus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 220.
pyraustæ Viereck. *Ibid.*, Bull. 22, 220.

Ichneutidea Ashmead.

secunda Rohwer. Conn. Geol. Nat. Hist. Surv., Bull. 22, 221.

Eubadizon Nees.

lithocolletidis Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 221.

Meteorus Haliday.

communis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 222.
dimidiatus Cresson. *Ibid.*, Bull. 22, 223.
exareolatus Viereck. *Ibid.*, Bull. 22, 223.
hyphantriæ Riley. *Ibid.*, Bull. 22, 223.
indagator Riley. *Ibid.*, Bull. 22, 222.
petiolariferus Viereck. *Ibid.*, Bull. 22, 223.
pretiosus Viereck. *Ibid.*, Bull. 22, 223.
triangularis Muesbeck. Can. Ent., li, 115.
versicolor Wesmael. *Ibid.*, Bull. 22, 223.

Euphorus Nees.

mellipes Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 224.

Dinocampus Fœrster.

pyri Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 225.

Perilitus Nees.

americanus Riley. Conn. Geol. Nat. Hist. Surv., Bull. 22, 218.

Orgilus Haliday.

detectiformis Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 226.

Bassus Fabricius.

Microdus Authors.

agilis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 227.
annulipes Cresson. *Ibid.*, Bull. 22, 227.
brittoni Viereck. *Ibid.*, Bull. 22, 227.
buttricki Viereck. *Ibid.*, Bull. 22, 228.
discolor Cresson. *Ibid.*, Bull. 22, 227.
erythrogaster Viereck. *Ibid.*, Bull. 22, 227.
pyrifolii Viereck. *Ibid.*, Bull. 22, 226.
rugareolatus Viereck. *Ibid.*, Bull. 22, 228.
sanctus Say. *Ibid.*, Bull. 22, 228.
waldeni Viereck. *Ibid.*, Bull. 22, 228.
winkleyi Viereck. *Ibid.*, Bull. 22, 227.

Bracon Panzer.

Agathis Latreille.

branfordensis Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 230.
sassacus Viereck. *Ibid.*, Bull. 22, 230.
semirubra Viereck. *montrealensis* Morrison. *Ibid.*, Bull. 22, 230.
solidaginis Viereck. *Ibid.*, Bull. 22, 230.

Spathius Nees.

sp.

Ascogaster Wesmael.

provancheri Dalla Torre var. **pallidicornis** Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 231.

Chelonus Jurine.

fissus Provancher. Conn. Geol. Nat. Hist. Surv., Bull. 22, 232.
konkaputus Viereck. *Ibid.*, Bull. 22, 232.
mysticorum Viereck. *Ibid.*, Bull. 22, 232.
sassacus Viereck. *Ibid.*, Bull. 22, 232.

Sigalphus Latreille.

Sphæropyx Illiger.

bicolor Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 233.

Urosigalphus Ashmead.

mohawkorum Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 234.

wampanoagorum Viereck. *Ibid.*, Bull. 22, 234.

Epirhyssalus Ashmead.

atriceps Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 235.

Bucculatriplex Viereck.

secundus Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 765.

sp. *Ibid.*, Bull. 22, 766.

Aleiodes Wesmael.

burrus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 236.

ceruræ Ashmead. Proc. U. S. Nat. Mus., 1888, 634.

parasiticus Norton. *Ibid.*, Bull. 22, 235.

terminalis Cresson. *Ibid.*, Bull. 22, 235.

waldeni Viereck. *Ibid.*, Bull. 22, 235.

Hormius Nees.

completus Provancher. Conn. Geol. Nat. Hist. Surv., Bull. 22, 236.

Heterospilus Halliday.

eurostæ Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 238.

Polystenidea Viereck.

metacomet Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 238.

Family MYERSIIDÆ.

Thaumatotypidea Viereck.

spinulata Strickland. Conn. Geol. Nat. Hist., Surv., Bull. 22, 238. (A.B.C.)

Family EVANIIDÆ.

Gasteruption Latreille.

Fœnus Fabricius.

micrurus Kieffer. Conn. Geol. Nat. Hist. Surv., Bull. 22, 240.

montanus Cresson var. **incertus** Cresson. *Ibid.*, Bull. 22, 240.

tarsatorius Say. *Ibid.*, Bull. 22, 240.

Hyptia Illiger.

harpyoidea Bradley. Conn. Geol. Nat. Hist. Surv., Bull. 22, 240.

Family TRIGONALIDÆ.

Lycogaster Schuckard.

pullatus Schuckard var. **hollensis** Melander and Brues. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 243.

Family CAPITONIIDÆ.

Capitonius Brullé.

saperdæ Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 766.

Family ICHNEUMONIDÆ.

Praon Haliday.

alaskensis Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 259.
pequodorum Viereck. *Ibid.*, Bull. *22*, 259.

Aphidius Nees.

avenaphis Fitch. *granariaphis.* Conn. Geol. Nat. Hist. Surv., Bull. *22*, 260.
exareolatus Viereck. *Ibid.*, Bull. *22*, 260.
nigripes Ashmead. *Ibid.*, Bull. *22*, 260.
polygonaphis Fitch. *Ibid.*, Bull. *22*, 260.
rapæ Curtis. *Ibid.*, Bull. *22*, 260.
rosæ Haliday. *Ibid.*, Bull. *22*, 260.
testaceipes Cresson. *Ibid.*, Bull. *22*, 259.

Cymodusa Holmgren.

distincta Cresson. Conn. Geol. Nat. Hist., Surv., Bull. 22, 262.

Sagaritis Holmgren.

aprilis Viereck. Conn. Geol. Nat. Hist., Surv., Bull. *22*, 262.
conjunctiformis Viereck. *Ibid.*, Bull. *22*, 262.
dubitatus Cresson. *provancheri.* *Ibid.*, Bull. *22*, 262.
patsuiketorum Viereck. *Ibid.*, Bull. *22*, 262.

Campoplex Gravenhorst.*

amasecontorum Viereck. **(Nepiera).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 266.
clisiocampæ Weed. **(Ameloctonus).** *Ibid.*, Bull. 22, 266.
diversicolor Viereck. **(Hyposoter).** *Ibid.*, Bull. 22, 267.
elyi Viereck. **(Hypothereutes).** *Ibid.*, Bull. 22, 264.
etemankiakorum Viereck. **(Bathyplectes).** *Ibid.*, Bull. 22, 263.
fugitivus Say. **(Ameloctonus).** *Ibid.*, Bull. 22, 266.
grossulariforæ Viereck. **(Campoplex).** *Ibid.*, Bull 22, 263.
kiehtani Viereck. **(Angitia).** *Ibid.*, Bull. 22, 265.
macer Cresson. **(Angitia).** *Ibid.*, Bull. 22, 265.
maquinnai Viereck. **(Campoplex).** *Ibid.*, Bull. 22, 263.
metacomet Viereck. **(Holocremnus).** *Ibid.*, Bull. 22, 264.
nolæ Ashmead. **(Campoplex).** *Ibid.*, Bull. 22, 263.
œdemisiæ Ashmead. **(Ameloctonus).** *Ibid.*, Bull. 22, 266.
œdemisiformis Viereck. **(Angitia).** *Ibid.*, Bull. 22, 265.
openangorum Viereck. **(Angitia).** *Ibid.*, Bull. 22, 265.
parviformis Viereck. **(Angitia).** *Ibid.*, Bull. 22, 265.
pentagœtorum Viereck. **(Campoplex).** *Ibid.*, Bull. 22, 263.
pilosulus Provancher. **(Ameloctonus).** *Ibid.*, Bull. 22, 266.
ruficoxa Provancher. **(Angitia).** *Ibid.*, Bull. 22, 265.
vernalis Viereck. **(Hypothereutes).** *Ibid.*, Bull. 22, 264.
woonandi Viereck. **(Angitia).** *Ibid.*, Bull. 22, 265.

Casinaria Holmgren.

argentea Norton. (Subgenus?). Conn. Geol. Nat. Hist. Surv., Bull. 22, 273.
assita Norton. (Subgenus?) *Ibid.*, Bull. 22, 272.
ceanothi Viereck. **(Pseudocasinaria).** *Ibid.*, Bull. 22, 270.
diversa Norton. (Subgenus?). *Ibid.*, Bull. 22, 272.
eupitheciæ Viereck. **(Casinaria).** *Ibid.*, Bull. 22, 270.
genuina Norton. **(Neonortonia).** *Ibid.*, Bull. 22, 271.
glauca Norton. (Subgenus?). *Ibid.*, Bull. 22, 272.
porrecta Cresson. **(Eripternoides).** *Ibid.*, Bull. 22, 269.
radiolata Provancher. **(Eripternus).** *Ibid.*, Bull. 22, 269.
scabriformis Viereck. **(Casinaria).** *Ibid.*, Bull. 22, 270.
sokanakiakorum Viereck. **(Idechtis).** *Ibid.*, Bull. 22, 270.
villosa Norton. **(Anisitsia).** *Ibid.*, Bull. 22, 272.
vitticollis Norton. **(Anisitsia).** *Ibid.*, Bull. 22, 271.

* See also appendix.

Paracanidia Viereck.

elyi Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 273.

Ceratogastra Ashmead.

fasciata Cresson. *ornata* Say. *Ceratosoma.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 273.

Pristomerus Curtis.

olamonus Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 274.

Porizon Fallen.

conotracheli Riley. *Thersilochus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 275.

Porizonidea Viereck.

sp.

Orthopelma Taschenberg.

diastrophi Ashmead. *Prœdrus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 275.

luteolator Gravenhorst. Proc. U. S. Nat. Mus., 49, 226.

Plectiscidea Viereck.

contentionis Viereck. *Mesoleptus rufipes.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 276.

Cremaster Gravenhorst.

forbesii Weed. Proc. U. S. Nat. Mus., 53, 513.

Mesochorus Gravenhorst.

calais Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 280.
scitulus Cresson. *Ibid.*, Bull. 22, 279.

Paniscus Gravenhorst.

geminatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 280.

Erigorgus (Fœrster) Brischke.

Anomalon Authors.

anale Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 284.
ferrugineum Norton. *Ibid.*, Bull. 22, 285.
hyaline Norton. *Ibid.*, Bull. 22, 284.
luteopectum Norton. *Ibid.*, Bull. 22, 284.
prismaticum Norton. *Ibid.*, Bull. 22, 284.
rufulum Provancher. *Ibid.*, Bull. 22, 284.

Heteropelma Wesmael.

flavicorne Brullé. Conn. Geol. Nat. Hist. Surv., Bull. 22, 285.

Therion Curtis.

Exochilum Wesmael.

morio Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. 22, 286.
sassacus Viereck. *Ibid.*, Bull. 22, 286.
tenuipes Norton. *Ibid.*, Bull. 22, 286.
waccagum Viereck. *Ibid.*, Bull. 22, 287.

Brachixiphosoma Viereck.

pyralidis Ashmead. *Eiphosoma.* Trans. Am. Ent. Soc., xxiii, 191.

Thyreodon Brullé.

brullei Viereck. *morio.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 287.

Anomalon Panzer.

Nototrachys Marshall.

sp. Conn. Geol. Nat. Hist. Surv., Bull. 22, 766.

Ophion Fabricius.

arcuatus Felt. Conn. Geol. Nat. Hist. Surv., Bull. 22, 288.
bilineatus Say. *Ibid.*, Bull. 22, 287.
macrurus Linnæus. *Ibid.*, Bull. 22, 287.
purgatus Say. *Ibid.*, Bull. 22, 288.
slossoni Davis. *Ibid.*, Bull. 22, 287.

Rogas Nees.

honestus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 289.

Mesoleptidea Viereck.

Mesoleptus Authors.

albifrons Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 290.
decens Cresson. *Ibid.*, Bull. 22, 290.

Catoglyptus Fœrster.

fucatus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 291.

Spanotecnus Fœrster.

concolor Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 292.
obscurellus Davis. *Ibid.*, Bull. 22, 292.

Mesoleius Holmgren.

scapularis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 292.

Trematopygus Holmgren.

Holmgrenia Fœrster.

tarsalis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 293.

Rhimphalea Fœrster.

erythrogastra Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 296.

Polyblastus Hartig.

pedalis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 297.

Erromenus Holmgren.

dimidiatus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 298.

Euceros Gravenhorst.

flavescens Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 299.

thoracicus Cresson. *Ibid.*, Bull. 22, 299.

Sympherta Fœrster.

burra Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 299.

Rhorus Fœrster.

bicolor Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 300.

Anecphysis Fœrster.

ruficrus Walsh. Conn. Geol. Nat. Hist. Surv., Bull. 22, 301.

Exenterus Hartig.

consors Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 301.

Syrphoctonus Fœrster.

agilis Cresson. *Bassus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 302.

Diplazon (Nees) Gravenhorst.

Bassus Authors.

antennatus Davis. **(Zootrephes).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 304.

bicapillaris Walsh. **(Homotropus).** *Ibid.*, Bull. 22, 304.

concinnus Cresson. *Ibid.*, Bull. 22, 303.

frontalis Cresson. *Ibid.*, Bull. 22, 302.

lætatorius Fabricius. *Ibid.*, Bull. 22, 303.

sycophanta Walsh. *Ibid.*, Bull. 22, 303.

Brephoctonus (Fœrster) Ashmead.

hygrotrecha Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 305.

Hyperacmus Holmgren.

ovatus Davis. Conn. Geol. Nat. Hist. Surv., Bull. 22, 305.

Exochus Gravenhorst.

pallipes Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 306.
propinquus Cresson. *Ibid.*, Bull. 22, 306.
semirufus Cresson. *Ibid.*, Bull. 22, 306.

Chorineus Holmgren.

carinatus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 308.
costatus Davis. *Ibid.*, Bull. 22, 308.

Metopius Panzer.

pollinctorius Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 309.

Grotea Cresson.

anguina Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 309.

Euxorides Cresson.

americanus Cresson. **(Calliclisis).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 309.

Odontomerus Gravenhorst.

mellipes Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 311.

Phytodietus Gravenhorst.

annulatus Provancher. Proc. U. S. Nat. Mus., 57, 466.
pulcherrimus Cresson. *Ibid.*, 57, 462.
vulgaris Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 312.

Meniscus Schiődte.

elegans Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 312.
pulcherrimus Cresson. *Ibid.*, Bull. 22, 312.
superbus Provancher. *Ibid.*, Bull. 22, 312.

Lissonota Gravenhorst.
Lampronota Curtis.

americana Cresson. **(Alloplasta).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 314.
appalachia Viereck. **(Nadia).** *Ibid.*, Bull. 22, 314.
exilis Cresson. *Ibid.*, Bull. 22, 314.
frigida Cresson. *Ibid.*, Bull. 22, 314.
occidentalis Cresson. **(Alloplasta).** *Ibid.*, Bull. 22, 313.
philipi Viereck. *Ibid.*, Bull. 22, 314.
punctulata Cresson. *Ibid.*, Bull. 22, 314.
rubrica Cresson. *Ibid.*, Bull. 22, 314.
varia Cresson. **(Alloplasta).** *Ibid.*, Bull. 22, 314.

Cryptoideus Ashmead.
Xylophruridea Viereck.

agrili Viereck. Proc. U. S. Nat. Mus., 55, 536.
luctuosus Provancher. *Ibid.*, 55, 536.

Glypta Gravenhorst.

rufiscutellaris Cresson. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 317.

Clistopyga Gravenhorst.

annulipes Cresson. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 317.

Polysphincta Gravenhorst.

pontiaci Viereck. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 318.
rubricapensis Provancher. *Ibid.*, Bull. *22*, 317.
texana Cresson. *Ibid.*, Bull. *22*, 318.

Scambus Hartig.
Pimpla Authors.

cœlebs Walsh. **(Iseropus.)** Trans. St. Louis. Acad. Sci., iii, 141.
conquisitor Say. **(Itoplectis)**. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 319.
grapholithæ Cresson. **(Calliephialtes)**. *Ibid.*, Bull. *22*, 320.
inquisitoriellus Dalla Torre. **(Iseropus)**. *inquisitor*. *Ibid.*, Bull. *22*, 320.
inquisitoriellus var. **investigator** Walsh. *Ibid.*, Bull. *22*. 319.
marginatus Viereck. *Pimplidea æqualis*. Provancher. *Ibid.*, Bull. *22*, 319.
notandus Cresson. **(Epiurus)**. *Ibid.*, Bull. *22*, 320.
pedalis Cresson. **(Pimplidea)**. *Ibid.*, Bull. *22*, 319.
pterelas Say. **(Epiurus)**. *Ibid.*, Bull. *22*, 320.
rufopectus Cresson. **(Tromatobia)**. *Ibid.*, Bull. *22*, 320.
tecumsehi Viereck. **(Epiurus)**. *Ibid.*, Bull. *22*, 320.
tenuicornis Cresson. **(Delomerista)**. *Ibid.*, Bull. *22*, 319.
viduiformis Viereck. **(Iseropus)**. *Ibid.*, Bull. *22*, 766.

Theronia Holmgren.

melanocephala Brullé. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 323.

Ichneumon Linnæus.
Ephialtes Gravenhorst.

irritator Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 324.

Megarhyssa Ashmead.

atrata Fabricius. *Thalessa.* Black long-sting. Conn. Geol. Nat. Hist. Surv., Bull. 22, 325.

greenei Viereck. *Ibid.,* Bull. 22, 325. (A.I.B.)

lunator Fabricius. *Thalessa.* Lunate long-sting. *Ibid.,* Bull. 22, 325.

Rhyssa Gravenhorst.

lineolata Kirby. *nitida* merrill. *albomaculata* Cresson. Conn. Nat. Hist. Surv., Bull. 22, 325-6.

Rhyssella Rohwer.

humida Say. Proc. U. S. Nat. Mus., 57, 423.

Arotes Gravenhorst.*

amœnus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 326.

Coleocentrus Gravenhorst.

rufus Provancher. Conn. Geol. Nat. Hist. Surv., Bull. 22, 327.

Gelis Thunberg.

Pezomachus Gravenhorst.

lymensis Strickland. **(Micromeson).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 327.

minimus Walsh. *Ibid.,* Bull. 22, 328.

ottawænsis Harrington. *Ibid.,* Bull. 22, 328.

Mesostenidea Viereck.

spinaria Brullé. (*Polyænus.*) Conn. Geol. Nat. Hist. Surv., Bull. 22, 329.

Acroricnus Ratzeburg.

junceus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 330.

Joppidium Walsh.

peregrinus Cresson. *Mesoleptus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 330.

Agrothereutes Fœrster.

Cryptus Fabricius.

alacris Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 332.

americanus Cresson. *Ibid.,* Bull. 22, 332.

canadensis Provancher. *Ibid.,* Bull. 22, 332.

* See also appendix.

cressoni Viereck. *Ibid.*, Bull. 22, 331.
hirtifrons Ashmead. *Ibid.*, Bull. 22, 330.
hyslopi Viereck. *Ibid.*, Bull. 22, 332.
limatus Cresson. *Ibid.*, Bull. 22, 332.
lophyri Norton. *Ibid.*, Bull. 22, 331.
mundus Provancher. *Ibid.*, Bull. 22, 331.
nuncius Say. Compl. Writ., ii, 693.
rufus Provancher. *Ibid.*, Bull. 22, 330.

Phygadeuon Gravenhorst.

auriculiferus Viereck. **(Bachia).** Conn. Geol. Nat. Hist Surv., Bull. 22, 336.
brittoni Viereck. **(Bachia).** Ibid., Bull. 22, 335.
melanocerus Viereck. **(Plesignathus).** *Ibid.*, Bull. 22, 335.
nortoni Viereck. **(Plesignathus).** *Ibid.*, Bull. 22, 335.
orbitaliformis Viereck. **(Scinacopus).** *Ibid.*, Bull. 22, 335.
quintilis Viereck. **(Plesignathus).** *Ibid.*, Bull. 22, 334.
ruficornis Provancher. *Ibid.*, Bull. 22, 334.
tæniatus Viereck. **(Plesignathus).** *Ibid.*, Bull. 22, 335.
tumidiformis Viereck. **(Bachia).** *Ibid.*, Bull. 22, 335.
vulgaris Cresson. *Ibid.*, Bull. 22, 334.

Ænoplex Fœrster.

smithi Packard. *Phygadeuon.* Proc. Bost. Nat. Hist., ix, 346.

Hemiteles Gravenhorst.

algonquinus Viereck. **(Rhadinocera).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 339.
areator tenellus Say. **(Orthizema).** *utilis.* *Ibid.*, Bull. 22, 337.
crassiformis Viereck. **(Idemum).** *Ibid.*, Bull. 22, 339.
eximius Cresson. *Mesoleptus.* *Ibid.*, Bull. 22, 337.
fulvipes Gravenhorst. **(Astomaspis).** *Ibid.*, Bull. 22, 338.
laticinctus Ashmead. *Ibid.*, Bull. 22, 339.
loniceræ Viereck. **(Ethelurgus).** *Ibid.*, Bull. 22, 338.
metacomet Viereck. **(Eriplanus.)** Bull. 22, 338.
nigricaniformis Viereck. **(Zoophthorus).** *Ibid.*, Bull. 22, 338.
orbiformis Viereck. **(Zamicrotoridea).** *Ibid.*, Bull. 22, 339.
rileyi Ashmead. *cressoniformis* Viereck. **(Otacustes).** *Ibid.*, Bull. 22, 339.

Stilpnus Gravenhorst.

americanus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 341.

Phæogenes Wesmael.

fungor Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 341.
hebe Cresson. *Ibid.*, Bull. 22, 341.
hebrus Cresson. *Ibid.*, Bull. 22, 341.
helvolus Cresson. *Ibid.*, Bull. 22, 342.
quadriceps Cresson. *Ibid.*, Bull. 22, 341.
vincibilis Cresson. *Ibid.*, Bull. 22, 341.

Colpognathus Wesmael.

helvus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 342.

Trogus Gravenhorst.

brullei Cresson. **(Automalus).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 343.
vulpinus Gravenhorst. **(Psilomastix).** *exesorius*. *Ibid.*, Bull. 22, 343.

Amblyteles Wesmael.

Ichneumon Authors.

anceps Cresson. **(Ectopimorpha).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 349.
apertus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 345.
brevicinctor Say. **(Pterocormus?).** *Ibid.*, Bull. 22, 351.
brittoni Viereck. **(Pterocormus).** *Ibid.*, Bull. 22, 348.
centrator Say. **(Stenichneumon?).** *Ibid.*, Bull. 22, 346.
cincticornis Cresson. **(Stenichneumon?).** *Ibid.*, Bull. 22, 344.
cinctitarsis Provancher. **(Stenichneumon?).** *Ibid.*, Bull. 22, 345.
citrifrons Cresson. **(Pterocormus?).** *Ibid.*, *Bull.* 22, 353.
comes Cresson. **(Cratichneumon?).** *Ibid.*, Bull. 22, 352.
comes var. **aleatorius** Harris. **(Cratichneumon?).** *Ibid.*, Bull. 22, 352.
comptus Say. **(Pterocormus?).** *Ibid.*, Bull. 22, 353.
disparilis Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 348.
duplicatiformis Viereck. **(Barichneumon).** *Ibid.*, Bull. 22, 354.
electus Cresson. **(Amblyteles).** *Ibid.*, Bull. 22, 353.

extrematatis Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 344.
flavicornis Cresson. **(Stenichneumon?).** *Ibid.*, Bull. 22, 351.
flavizonatus Cresson. **(Cratichneumon?).** *Ibid.*, Bull. 22, 352.
footei Viereck. **(Pterocormus).** *Ibid.*, Bull. 22, 353.
galenus Cresson. **(Cratichneumon?).** *Ibid.*, Bull. 22, 351.
hospitus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 353.
infidelis Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 351.
instabilis Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 353.
jucundus Brullé. **(Pterocormus?).** *Ibid.*, Bull. 22, 346.
lætus Brullé. *canadensis. funestus.* **(Cratichneumon?)** *Ibid.*, Bull. 22, 352.
leviculus Cresson. **(Cratichneumon?).** *Ibid.*, Bull. 22, 353.
lewisii Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 347.
malacus Say. **(Stenichneumon?).** *Ibid.*, Bull. 22, 345.
merus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 351.
mimicus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 353.
nigratoricolor Viereck. **(Chasmias?).** *Ibid.*, Bull. 22, 344.
nortoni Cresson. **(Amblyteles).** *Ibid.*, Bull. 22, 349.
ormenus Cresson. **(Stenichneumon?).** *Ibid.*, Bull. 22, 349.
otiosus Say. **(Stenichneumon?).** *Ibid.*, Bull. 22, 346.
parvus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 352.
pepticus Say. **(Cratichneumon?).** *Ibid.*, Bull. 22, 351.
pequoitorum Viereck. **(Chasmias?).** *Ibid.*, Bull. 22, 345.
pulcher Brullé. **(Cœlichneumon).** *Ibid.*, Bull. 22, 350.
putus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 347.
quadrizonatus Viereck. **(Pterocormus).** *Ibid*,. Bull. 22, 352.
quintilis Viereck. **(Pterocormus).** *Ibid.*, Bull. 22, 354.
sassacus Viereck. **(Cœlichneumon).** *Ibid.*, Bull. 22, 349.
seminiger Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 348.
signatipes Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 348.
soror Cresson. **(Barichneumon).** *Ibid.*, Bull. 22, 348.
stadaconensis Provancher. **(Amblyteles).** *Ibid.*, Bull. 22, 351, 355.
subcyaneus Cresson. **(Cratichneumon?).** *Ibid.*, Bull. 22, 351.
succinctus Brullé. **(Cratichneumon?).** *Ibid.*, Bull. 22, 354.
suturalis Say. **(Amblyteles).** *Ibid.*, Bull. 22, 349.
ultus Cresson. **(Amblyteles).** *Ibid.*, Bull. 22, 351.
ultus var. **rogalis** Cresson. **(Amblyteles).** *Ibid.*, Bull. 22, 351.

unifasciatorius Say. **(Pterocormus?).** *Ibid.*, Bull. 22, 351.
versabilis Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 352.
vinnulus Cresson. **(Pterocormus?).** *Ibid.*, Bull. 22, 353.
w-album Cresson. **(Cratichneumon?).** *Ibid.*, Bull. 22, 348, 354.
winkleyi Viereck. **(Pterocormus).** *Ibid.*, Bull. 22, 348.

Family FIGITIDÆ.

Anacharis Dalman.

sp. Conn. Geol. Nat. Hist. Surv., Bull. 22, 365.

Aspicera Dahlbom.

sp. Conn. Geol. Nat. Hist. Surv., Bull. 22, 365.

Family CYNIPIDÆ.

Periclistus Fœrster.

pirata Osten Sacken. *Aulax. Rhodites globulus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 373.

Aylax Hartig.

podagræ Bassett. Conn. Geol. Nat. Hist. Surv., Bull. 22, 374.
tumida Bassett. Lettuce tumor gall. *Ibid.*, Bull. 22, 375. (W.B.)

Ceroptres Hartig.

ficus Fitch. Conn. Geol. Nat. Hist. Surv., Bull. 22, 377. (H.F.B.)

Synergus Hartig.

lana Fitch. Oak wool gall. Conn. Geol. Nat. Hist. Surv., Bull. 380. (B.H.W.)

Philonyx Fitch.

erinacei Walsh. Oak hedghog gall. N. Y. St. Mus., Bull. 200, 94.

Biorhiza Westwood.

forticornis Walsh. **(Xanthoteras).** Oak fig gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 384.
hirta Bassett. **(Xystoteras)** *Philonix.* *Ibid.*, Bull. 22, 383.

Neuroterus Hartig.

batatus Fitch. Oak potato gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 384.

consimilis Bassett. *Ibid.*, Bull. 22, 387.
distortus Bassett. *Ibid.*, Bull. 22. 388.
dubius Bassett. *Ibid.*, Bull. 22, 388.
exiguissimus Bassett. *Ibid.*, Bull. 22. 389.
exiguus Bassett. *Ibid.*, Bull. 22, 389.
floccosus Bassett. *Ibid.*, Bull. 22, 390.
majalis Bassett. *Ibid.*, Bull. 22, 385.
noxiosus Bassett. Noxious Oak Gall. *Ibid.*, Bull. 22, 391.
pallidus Bassett. *Ibid.*, Bull. 22, 386.
tectus Bassett. *Ibid.*, Bull. 22, 389.
umbilicatus Bassett. Oak button gall. *Ibid.*, *Bull.* 22, 390.

Dryophanta Fœrster.

corrugis Bassett. Conn. Geol. Nat. Hist. Surv., Bull. 22, 397.
ignota Bassett. *Ibid.*, Bull. 22, 398.
longicornis Bassett. *Ibid.*, Bull. 22, 397, 398.
pallipes Bassett. *Ibid.*, Bull. 22, 398.
papula Bassett. *Ibid.*, Bull. 22, 400.
parvula Bassett. *Ibid.*, Bull. 22, 396.
pedunculata Bassett. *Ibid.*, Bull. 22, 400.

Holcaspis Mayr.

duricoria Bassett. Pointed bullet gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 402.
fasciata Bassett. *Ibid.*, Bull. 22, 402.
globulus Fitch. Oak bullet gall. *Ibid.*, Bull. 22, 401.
rugosa Bassett. *Ibid.*, Bull. 22, 401.

Cynips Linnæus.

confluens Harris. Oak or May apple. Conn. Geol. Nat. Hist. Surv., Bull. 22, 404.
cristata Stebbins. *Ibid.*, Bull. 22, 768. (G.D.)
decidua Bassett. Ins. Galls Springfield, 20.
strobilana Osten Sacken. Pine cone oak gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 403.

Amphibolips Reinhard.

badia Bassett. Conn. Geol. Nat. Hist. Surv., Bull. 22, 405.
cœlebs Osten Sacken. Oak spindle gall. *Ibid.*, Bull. 22, 407.
cooki Gillette. *Ibid.*, Bull. 22, 768. (W.B.)
illicifoliæ Bassett. Scrub oak gall. *Ibid.*, Bull. 22, 405. (G.D.)
inanis Osten Sacken. Empty oak apple. *Ibid.*, Bull. 22, 407.

nubilipennis Harris. *Ibid.*, Bull. 22, 408.
prunus Walsh. Acorn plum gall. *Ibid.*, Bull. 22, 406. (G.D.)
sculpta Bassett. *Ibid.*, Bull. 22, 408.
tinctoriæ Ashmead. *Ibid.*, Bull. 22, 768. (G.D.)
verna Bassett. *Ibid.*, Bull. 22, 404. (H.F.B.)

Andricus Hartig.

ashmeadii Bassett. Conn. Geol. Nat. Hist. Surv., Bull. 22, 418. (H.F.B.)
ceropteroides Bassett. **(Callirhytis).** *Ibid.*, Bull. 22, 434.
cicatricula Bassett. *Ibid.*, Bull. 22, 413. (H.F.B.)
corniger Osten Sacken. Horned knot oak gall. *Ibid.*, Bull. 22, 414.
exiguus Bassett. *Ibid.*, Bull. 22, 417. (H.F.B.)
formosus Bassett. *Ibid.*, Bull. 22, 409. (H.F.B.)
fruticola Ashmead. *Ibid.*, Bull. 22, 769.
futilis Osten Sacken. **(Callirhytis).** *papillatus.* Oak wart gall. *Ibid.*, Bull. 22, 433.
glandulus Beutenmüller. *Ibid.*, Bull. 22, 770.
incertus Bassett. *Ibid.*, Bull. 22, 414. (H.F.B.)
obtusilobæ Bassett. *Ibid.*, Bull. 22, 415. (H.F.B.)
operatola Riley and Bassett. *Ibid.*, Bull. 22, 418. (H.F.B.)
operator Osten Sacken. *Ibid.*, Bull. 22, 429.
ostensackenii Bassett. *Ibid.*, Bull. 22, 412. (H.F.B.)
palustris Osten Sacken. Succulent oak gall. *Ibid.*, Bull. 22, 419.
patiens Bassett. *Ibid.*, Bull. 22, 416. (H.F.B.)
pattoni Bassett. *Ibid.*, Bull. 22, 423. (H.F.B.)
petiolicola Bassett. Oak petiole gall. *Ibid.*, Bull. 22, 412.
piger Bassett. *Ibid.*, Bull. 22, 422. (H.F.B.)
piperoides Bassett. *Ibid.*, Bull. 22, 415. (H.F.B.)
pruinosus Bassett. *Ibid.*, Bull. 22, 411. (H.F.B.)
pulchellus Bassett. *Ibid.*, Bull. 22, 416. (H.F.B.)
punctatus Bassett. **(Callirhytis).** Oak knot gall. *Ibid.*, Bull. 22, 431.
pusulatoides Bassett. **(Callirhytis).** *Ibid.*, Bull. 22, 433. (H.F.B.)
saccularis Bassett. **(Callirhytis).** *Ibid.*, Bull. 22, 432. (H.F.B.)
scitulus Bassett. **(Callirhytis).** *Ibid.*, Bull. 22, 429.

seminator Harris. **(Callirhytis).** Oak seed gall. *Ibid.,* Bull. 22, 430.
similis Bassett. **(Callirhytis).** Scrub oak club gall. *Ibid.,* Bull. 22, 428.
singularis Bassett. **(Callirhytis).** Small oak apple. *Ibid.,* Bull. 22, 431. (H.F.B.)
tuberosus Bassett. **(Callirhytis).** *Ibid.,* Bull. 22, 430. (H.F.B.)
utriculus Bassett. *Ibid.,* Bull. 22, 423.
ventricosa Bassett. *Ibid.,* Bull. 22, 409. (H.F.B.)

Solenozopheria Ashmead.

vaccinii Ashmead. Huckleberry gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 434.

Diastrophus Hartig.

bassettii Beutenmüller. Bassett's Blackberry gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 438.
cuscutæformis Osten Sacken. Blackberry seed gall. *Ibid.,* Bull. 22, 435.
fragariæ Beutenmüller. Can. Ent., xlvii, 353.
minimus Bassett. Conn. Geol. Nat. Hist. Surv., Bull. 22, 438.
nebulosus Osten Sacken. Blackberry knot gall. *Ibid.,* Bull. 22, 435.
potentillæ Bassett. *Gonaspis.* Cinquefoil axil gall. *Ibid.,* Bull. 22, 436.
radicum Bassett. Raspberry root gall. *Ibid.,* Bull. 22. 437.
similis Bassett. *Ibid.,* Bull. 22, 437.

Dipolepis Geoffroy.
Rhodites Hartig.

bicolor Harris. Spiny rose gall. Conn. Geol. Nat. Hist. Surv., Bull. 22, 440.
dichlocerus Harris. Long rose gall. *Ibid.,* Bull. 22, 441.
globuloides Beutenmüller. Globular rose gall. *Ibid.,* Bull. 22, 771.
gracilis Ashmead. *Ibid.,* Bull. 22, 441, 771.
ignotus Osten Sacken. Mealy rose gall. *Ibid.,* Bull. 22, 441.
radicum Osten Sacken. Rose root gall. *Ibid.,* Bull. 22, 441.
rosæ Linnæus. Mossy rose gall. *Ibid.,* Bull. 22, 441.

Family IBALIIDÆ.

Ibalia Latreille.

maculipennis Haldeman. Conn. Geol. Nat. Hist. Surv., Bull. 22, 442.

Family MYRMARIDÆ.

Anaphes Haliday.

conotracheli Girault. *Anaphoidea.* Jour. N. Y. Ent. Soc. xviii, 246. Conn. Geol. Nat. Hist. Surv., Bull. 22, 447.
pratensis Fœrster. Can. Ent., 44, 88.

Family TETRASTICHIDÆ.

Tetrastichus Haliday.

malacosomæ Girault. Insec. Insc. Menstr. iv, 110.
sp. reared from coccids.
sp. reared from *Diastrophus cuscutæformis.*

Family ENTEDONTIDÆ.

Pleurotropis Fœrster.

lithocolletidis Ashmead. Proc. U. S. Nat. Mus., 43, 178.
tarsalis Ashmead. *Ibid.,* 43, 178.

Closterocerus Westwood.

tricinctus Ashmead. *Entedon* Dalman. Conn. Geol. Nat. Hist. Surv., Bull. 22, 458. (C.D.J.)

Family EULOPHIDÆ.*

Sympiesis Fœrster.

massasoit Crawford. Proc. U. S. Nat. Mus., 45, 258.
nigrifemora Ashmead. *Systomspiesis.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 461.

Eulophus Geoffroy.

sp.

Family ELASMIDÆ.

Elasmus Westwood.

atratus Howard. Conn. Geol. Nat. Hist. Surv., Bull. 22, 464.

* See also appendix.

Family ELACHERTIDÆ.

Cirrospilus Westwood.

flavicinctus Riley. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 465.
marylandi Girault. Descr. Hymenop. Chalcid., 4.

Family PTEROMALIDÆ.

Pteromalus Swederus.

boucheanus Ratzeburg. **(Dibrachys).** Conn. Geol. Nat. Hist. Surv., Bull. *22*, 475.
nidulans (Fœrster) Thompson. ***egregius*** Fœrster. *Ibid.*, Bull. *22*, 773.
tabacum Fitch. **(Hypopteromalus).** *Ibid.*, Bull. *22*, 474.
verditer Norton. *Ibid.*, Bull. *22*, 472.

Merisus Walker.

isosomatis Riley. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 478.

Pachyneuron Walker.

nigrocyaneum Norton. *Chiropachys nigrocyaneus.* Conn. Geol. Nat Hist. Surv., Bull. *22*, 481.

Sphegigaster Spinola.

sp.

Family APHELINIDÆ.

Encarsia Fœrster.

luteola Howard. Bur. Ent., Tech. ser., i, 29: Conn. Geol. Nat. Hist. Surv., Bull. *22*, 489.

Aphelinus Dalman.

mali Haldeman. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 490.

Prospaltella Ashmead.

perniciosi Tower. Parasite of the San José scale. Ann. Ent. Soc. Am., vi, 125.

Family ENCYRTIDÆ.

Blastothrix Mayr.

sericea Dalman. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 502.

Family EUPELMIDÆ.

Anastatus Motschulsky.

bifasciatus Fonscolombe. Bur. Ent., Bull. 91, 170.

Family CALLIMOMIDÆ.

Ormyrus Westwood.

sp.

Monodontomerus Westwood.

æreus Walker. Conn. Geol. Nat. Hist. Surv., Bull. 22, 514.
dentipes Boheman. Vet. Akad. Handl., 41, 23.

Syntomaspis Fœrster.

lazulella Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 514.

Callimome Spinola.

brevicauda Osten Sacken. *Torymus*. Conn. Geol. Nat. Hist. Surv., Bull. 22, 515.
flavicoxa Osten Sacken. *Torymus*. *Ibid.*, Bull. 22. 515.
sp. *Torymus*.

Family MISCOGASTERIDÆ.

Megorismus Walker.

fletcheri Crawford. Conn. Geol. Nat. Hist. Surv., Bull. 22, 773.

Family EURYTOMIDÆ.

Brucophagus Ashmead.

funebris Howard. Clover-seed Chalcis. Conn. Geol. Nat. Hist. Surv., Bull. 22, 520.

Eurytoma Illiger.

diastrophi Walsh. Conn. Geol. Nat. Hist. Surv., Bull. 22, 521.
pissodis Girault. Bull. Brook. Ent. Soc., xii, 88.

Isosoma Walker.

sp.

Evoxysoma Ashmead.

vitis Saunders. Conn. Geol. Nat. Hist. Surv., Bull. 22, 523.

Family PERILAMPIDÆ.

Perilampus Latreille.

hyalinus Say. *Cyaneus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 524.

platygaster Say. *Ibid.,* Bull. 22, 524.

Family CHALCIDIDÆ.

Smicra Spinola.

rufofemorata Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 526.

Spilochalcis Thomson.

mariæ Riley. Conn. Geol. Nat. Hist. Surv., Bull. 22, 527.

torvina Cresson. *Ibid.,* Bull. 22, 527.

Eusayia Ashmead.

debilis Say. *Sayiella. Chalcis.* Compl. Writ., ii, 720.

Chalcis Fabricius.

ovata Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 528. (A.E.V.)

Family LEUCOSPIDÆ.

Leucospis Fabricius.

affinis Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 528.

Family PLATYGASTRIDÆ.

Anopedius Fœrster.

error Fitch. Conn. Geol. Nat. Hist. Surv., Bull. 22, 533.

Polygnotus Fœrster.

striaticeps Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 537.

Isocybus Fœrster.

pallipes Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 541.

Family SCELIONIDÆ.

Telenomus Haliday.

coloradensis Crawford. Proc. Wash. Ent. Soc., xi, 206.

Prosacantha Nees.

marylandica Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 552.

Teleas Latreille.

coxalis Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 553.

Caloteleia Westwood.

marlatti Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 554.

Idris Fœrster.

nigricornis Brues. Conn. Geol. Nat. Hist. Surv., Bull. 22, 555. (W.M.W.)

Scelio Latreille.

hyalinipennis Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 556.

ovivorus Riley. *Ibid.*, Bull. 22, 556. (W.H.P.)

Family CERAPHRONIDÆ.

Conostigmus Dahlbom.

Megaspilus Westwood.

schwarzi Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 559.

Eumegaspilus Ashmead.

erythrothorax Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 559. (W.M.W.)

Family DIAPRIIDÆ.

Entomacis Fœrster.

ambigua Brues. *Hemilexodes.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 563.

Galesus Curtis.

vierecki Brues. Conn. Geol. Nat. Hist. Surv., Bull. 22, 564.

Diapria Latreille.

conica Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. 22, 565. (W.H.P.)

Family BELYTIDÆ.

Leptorhaptus Fœrster.

conicus Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 570.

Family SERPHIDÆ.

Disogmus Fœrster.

obsoletus Brues. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 573.

Serphus Schrank.

californicus Holmgren. *Proctotrypes.* Conn. Geol. Nat. Hist. Surv., Bull. *22*, 575.
carolinensis Ashmead. *Ibid.*, Bull. *22*. 575.
caudatus Say. *Ibid.*, Bull. *22*, 574.
melliventris Ashmead. *Ibid.*, Bull. *22*, 575.
quadriceps Ashmead. Ibid., Bull. *22*, 576.

Exallonyx Kieffer.

pallidicornis Brues. Jour. N. Y. Ent. Soc., xxvii, 14.

Family HELORIDÆ.

Helorus Latreille.

paradoxus Provancher. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 576.

Family PELECINIDÆ.

Pelecinus Latreille.

polyturator Drury. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 576.

Family FORMICIDÆ.

Stigmatomma Roger.

pallipes Haldeman. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 581.

Ponera Latreille.

coarctata pennsylvanica (Buckley) Emery. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 581. (W.M.W.)

Myrmecina Curtis.

graminicola americana Emery var. **brevispinosa** Emery. Conn. Geol. Nat. Hist. Surv., Bull. 22; 584. (W.M.W.)

Monomorium Mayr.

minutum Mayr var. **minimum** (Buckley) Emery. Conn. Geol. Nat. Hist. Surv., Bull. 22, 584.
pharaonis Linnæus. Little red house ant. *Ibid.*, Bull. 22, 584.

Solenopsis Westwood.

molesta Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 584.

Pheidole Westwood.

pilifera Roger. Conn. Geol. Nat. Hist. Surv., Bull. 22, 584.

Crematogaster Lund.

lineolatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 585.
lineolatus var. **cerasi** Fitch. *Ibid.*, Bull. 22, 585. (W.M.W.)

Stenamma Mayr.

brevicorne Mayr. Conn. Geol. Nat. Hist. Surv., Bull. 22, 585. (W.M.W.)

Aphænogaster Mayr.

fulva Roger. Conn. Geol. Nat. Hist. Surv., Bull. 22, 585. (W.M.W.)
fulva aquia (Buckley) Emery. *Ibid.*, Bull. 22, 586.
fulva aquia var. **picea** Emery. *Ibid.*, Bull. 22, 586. (W.M.W.)
mariæ Forel. *Ibid.*, Bull. 22, 585. (W.M.W.)
tennesseensis Mayr. *Ibid.*, Bull. 22, 585. (W.M.W.)
treatæ Forel. *Ibid.*, Bull. 22, 585.

Myrmica Latreille.

punctiventris Roger. Conn. Geol. Nat. Hist. Surv., Bull. 22, 587. (W.M.W.)
rubra brevinodis Emery var. **canadensis** Wheeler. *Ibid.*, Bull. 22, 587. (W.M.W.)
rubra scabrinodis Nylander var. **fracticornis** Emery. *Ibid.*, Bull. 22, 587.
rubra scabrinodis var. **sabuleti** Meinert. *Ibid.*, Bull. 22, 587.
rubra scabrinodis var. **schencki** Emery. *Ibid.*, Bull. 22, 587.

Leptothorax Mayr.

acervorum canadensis Provancher. Conn. Geol. Nat. Hist. Surv., Bull. 22, 588. (W.M.W.)
curvispinosus Mayr. *Ibid.*, Bull. 22, 588.
curvispinosus var. **ambiguus** Emery. *Ibid.*, Bull. 22, 589.
emersoni Wheeler. *Ibid.*, Bull. 22, 588. (W.M.W.)
longispinosus Roger. *Ibid.*, Bull. 22, 558. (W.M.W.)

Dolichoderus Lund.

mariæ Forel. Conn. Geol. Nat. Hist. Surv., Bull. 22, 589.
plagiatus Mayr. *Ibid.*, Bull. 22, 590.

Tapinoma Fœrster.

sessile Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 590.

Brachymyrmex Mayr.

heeri depilis Emery. Conn. Geol. Nat. Hist. Surv., Bull. 22, 591. (W.M.W.)

Prenolepis Mayr.

imparis Say. *Nylanderia.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 591.
imparis var. **minuta** Emery. *Nylanderia.* *Ibid.*, Bull. 22, 591.

Formicina Schuckard.

Lasius Fabricius.

brevicornis Emery. Conn. Geol. Nat. Hist. Surv., Bull. 22, 593.
claviger Roger. **(Acanthomyops).** *Ibid.*, Bull. 22, 594. (W.M.W.)
flavus nearcticus Wheeler. *Ibid.*, Bull. 22, 593. (W.M.W.)
interjectus Mayr. **(Acanthomyops).** *Ibid.*, Bull. 22, 594. (W.M.W.)
latipes Walsh. **(Acanthomyops).** *Ibid.*, Bull. 22, 594.
niger Linnæus var. **americanus** Emery. Garden ant. *Ibid.*, Bull. 22, 592.
niger var. **neoniger** Emery. *Ibid.*, Bull. 22, 593.
umbratus mixtus Nylander var. **aphidicola** Walsh. *Ibid.*, Bull. 22, 593.
umbratus mixtus var. **speculiventris** Emery. *Ibid.*, Bull. 22, 593. (W.M.W.)

Formica Latreille.

difficilis Emery var. **consocians** Wheeler. Conn. Geol. Nat. Hist. Surv., Bull. 22, 595. (W.M.W.)
exsectoides Forel. *Ibid.*, Bull. 22, 595.
fusca Linnæus var. **subænescens** Emery. *Ibid.*, Bull. 22, 596. (W.M.W.)
fusca var. **subsericea** Say. Silky ant. *Ibid.*, Bull. 22, 596.
nepticula Wheeler. *Ibid.*, Bull. 22, 595. (W.M.W.)
pallide-fulva nitidiventris Emery. *Ibid.*, Bull. 22, 595.
pallide-fulva schaufussi Mayr. *Ibid.*, Bull. 22, 595.
pallide-fulva schaufussi var. **incerta** Emery. *Ibid.*, Bull. 22, 595.
rufa integra Nylander. *Ibid.*, Bull. 22, 595. (W.M.W.)
rufa obscuriventris Mayr. *Ibid.*, Bull. 22, 595. (W.M.W.)
sanguinea aserva Forel. *Ibid.*, Bull. 22, 595. (W.M.W.)
sanguinea rubicunda Emery. *Ibid.*, Bull. 22, 595. (W.M.W.)
sanguinea rubicunda var. **subintegra** Emery. *Ibid.*, Bull. 22, 595.
subpolita Mayr. *Ibid.*, Bull. 22, 596. (G.M.)
subpolita var. **neogagates** Emery. *Ibid.*, Bull. 22, 596.
truncicola Nylander, subspecies **obscuriventris** Mayr. *Ibid.*, Bull. 22, 595.

Polyergus Latreille.

lucidus Mayr. Conn. Geol. Nat. Hist Surv., Bull. 22, 599. (G.M.)

Camponotus Mayr.

castaneus Latreille. Conn. Geol. Nat. Hist. Surv., Bull. 22, 600.
castaneus, subspecies **americanus** Mayr. *Ibid.*, Bull. 22, 600.
fallax Nylander var. **nearcticus** Emery. *Ibid.*, Bull. 22, 600.
herculeanus ligniperdus Latreille var. **novæboracensis** *Fitch*. *Ibid.*, Bull. 22, 600.
herculeanus pennsylvanicus DeGeer. Carpenter Ant. *Ibid.* Bull. 22, 600.
herculeanus pennsylvanicus var. **ferrugineus** Fabricius. *Ibid.*, Bull. 22, 600.

Family CHRYSIDIDÆ.

Omalus Jurine.

irridescens Norton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 602.
sinuosus Say. *Ibid.*, Bull. 22, 602.

Notozus Fœrster.

marginatus Patton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 603.

Hedychridium Latreille.

dimidiatum Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 603.

Hedychrum Latreille.

obsoletum Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 603,
violaceum Brullé. *Ibid.*, Bull. 22, 603.

Chrysis Linnæus.

cærulans Fabricius. **(Tetrachrysis).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 604.
nitidula Fabricius. **(Tetrachrysis).** *Ibid.*, Bull. 22, 604.
parvula Fabricius. **(Trichrysis).** *Ibid.*, Bull. 22, 604.
verticalis Patton. **(Chrysogona).** *Ibid.*, Bull. 22, 604.

Family BETHYLIDÆ.

Pristocera Klug.

armifera Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 609.

Lælius Ashmead.

tricarinatus Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 610.

Paralælius Kieffer.

pedatus Say. *Bethylus.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 610.

Epyrus Westwood.

rufipes Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 611.

Rhabdepyris Kieffer.

occidentalis Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 612.

Parasierola Cameron.

cellularis Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 612.

Family DRYINIDÆ.

Gonatopus Ljungh.

contortulus Patton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 614. (W.H.P.)

Aphelopus Dalman.

americanus Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 615.

Family SCOLIIDÆ.

Scolia Fabricius.

bicincta Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. 22, 616.

Campsomeris LePeletier.

plumipes Drury. *Elis.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 617.

Elis Fabricius.

interrupta Say. *Plesia. Myzine hamata.* Conn. Geol. Nat. Hist Surv., Bull. 22, 617.
quinquecincta Fabricius. *Plesia. Myzine sexcincta. Ibid.*, Bull. 22, 617.

Sierolomorpha Ashmead.

ambigua Ashmead. Conn. Geol. Nat. Hist. Surv., Bull. 22, 618.

Tiphia Fabricius.

brunneicornis Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 619.
egregia Viereck. *Ibid.*, Bull. 22, 619.
inornata Say. *Ibid.*, Bull. 22, 619.
punctata Robertson. *Ibid.*, Bull. 22, 619.
relativa Viereck. *Ibid.*, Bull. 22, 619.
waldeni Viereck. *Ibid.*, Bull. 22, 619.

Family SAPYGIDÆ.

Sapyga Latreille.

centrata Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 620.

Family METHOCIDÆ.

Methoca Latreille.

stygia Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 620.

Family MYRMOSIDÆ.

Myrmosa Latreille.

unicolor Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 621.

Family MUTILLIDÆ.

Pseudomethoca Ashmead.

canadensis Blake. Conn. Geol. Nat. Hist. Surv., Bull. 22, 622.

Nomiæphagus Ashmead.

simillimus Smith. *sanbornii*. Conn. Geol. Nat. Hist. Surv., Bull. 22, 623.

Dasymutilla Ashmead.

cariniceps Fox. *scrobinata* Rohwer. *Ibid.*, Bull. 22, 623.
castor Blake. Conn. Geol. Nat. Hist. Surv., Bull. 22, 624.
cypris Blake. *Ibid.*, Bull. 22, 623.
ferrugata Fabricius. *Ibid.*, Bull. 22, 623.
gibbosa Say. *Ibid.*, Bull. 22, 624.
lepeletierii Fox *harmoniiformis* Rohwer. *Ibid.*, Bull. 22, 624 (A.B.C.).
macra Cresson. *Ibid.*, Bull. 22, 624.
occidentalis Linnæus. *Ibid.*, Bull. 22, 624.
vesta Cresson var. **zella** Rohwer. *champlaini* Rohwer. *Ibid.*, Bull. 22, 623.

Ephuta Say.

scrupea Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 625.

Timulla Ashmead.

hexagona Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 625.
ornativentris Cresson. *Ibid.*, Bull. 22, 625.

Family PSAMMOCHARIDÆ.

Ceropales Latreille.

bipunctata Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 626.
fraterna Smith. *Ibid.*, Bull. 22, 626.
longipes Smith. *Ibid.*, Bull. 22, 626.
robinsoni Cresson. *Ibid.*, Bull. 22, 626.

Pseudagenia Kohl.

architecta Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 627.

Ageniella Banks.

calcarata Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 628.
iridipennis Cresson. *Ibid.*, Bull. 22, 628.

Priocnemis Schiődte.

alienata Smith. Conn. Geol. Nat. Hist. Surv., Bull. 22, 628.
conica Say. *Ibid.*, Bull. 22, 628.
germana Cresson. *Ibid.*, Bull. 22, 628.
notha Cresson. *Ibid.*, Bull. 22, 628.

Planiceps.

niger Cresson. Trans. Am. Ent. Soc., i, 136.

Episyron Schiődte.

biguttatus Fabricius. Conn. Geol. Nat. Hist. Surv., Bull. 22, 631.
quinque-notatus Say. 5-*notatus*. *Ibid.*, Bull. 22, 631.

Aporinellus Banks.

fasciatus Smith. Conn. Geol. Nat. Hist. Surv., Bull. 22, 631.

Pompiloides Radoszkowski.

argenteus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 631.
cylindricus Cresson. *Ibid.*, Bull. 22, 631.
marginatus Say. *Ibid.*, Bull. 22, 631.
subviolaceus Cresson. *Ibid.*, Bull. 22, 631.
tropicus Linnæus. *Ibid.*, Bull. 22, 631.

Sericopompilus Ashmead.

humilis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 632.

Arachnophroctonus Ashmead.

interruptus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 632.

Psammochares Latreille.

æthiops Cresson. **(Lophopompilus).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 633.
atrox Dahlbom. **(Lophopompilus).** *Ibid.*, Bull. 22, 633.
luctuosus Cresson. **(Psammochares).** *Ibid.*, Bull. 22, 633.
philadelphicus LePeletier. *Ibid.*, Bull. 22, 633.
relativus Fox. **(Psammochares).** *Ibid.*, Bull. 22, 633. (H.W.W.)
scelestus Cresson. **(Psammochares).** *Ibid.*, Bull. 22, 633.
tenebrosus Cresson. **(Psammochares).** *Ibid.*, Bull. 22, 633.
virginiensis Cresson. **(Anoplius).** *Ibid.*, Bull. 22, 633.

Family EUMENIDÆ.

Zethus Fabricius.

spinipes Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 634.

Eumenes Fabricius.

fraternus Say. Potter wasp. Conn. Geol. Nat. Hist. Surv., Bull. 22, 634.

Monobia Saussure.

quadridens Linnæus. Conn. Geol. Nat. Hist. Surv., Bull. 22, 635.

Nortonia Saussure.

symmorpha Saussure. Conn. Geol. Nat. Hist. Surv., Bull. 22, 635.

Odynerus Latreille.

albomarginatus Saussure. **(Symmorphus).** Conn. Geol. Nat. Hist Surv., Bull. 22, 636.
anormis Say. *Ibid.*, Bull. 22, 637. (H.W.W.)
birenimaculatus Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.
boscii LePeletier. *Ibid.*, Bull. 22, 637.
campestris Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636. (H.W.W.)
capra Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.
catskilli Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.

collega Saussure. *Ibid.*, Bull. 22, 637.
cristatus Saussure. **(Symmorphus).** *Ibid.*, Bull. 22, 636.
debilis Saussure. **(Symmorphus).** *Ibid.*, Bull 22, 636.
dorsalis Fabricius. *Ibid.*, Bull. 22, 637.
foraminatus Saussure. *Ibid.*, Bull. 22, 637.
leucomelas Saussure. *Ibid.*, Bull. 22, 637.
nortonianus Saussure. *Ibid.*, Bull. 22, 637.
pedestris Saussure. *Ibid.*, Bull. 22, 637.
pennsylvanicus Saussure. *Ibid.*, Bull. 22, 637.
spinolæ Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.
tigris Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.
unifasciatus Saussure. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.
vagus Saussure. *Ibid.*, Bull. 22, 637.
waldeni Viereck. **(Ancistrocerus).** *Ibid.*, Bull. 22, 636.

Family VESPIDÆ.

Vespa Linnæus.

crabro Linnæus. Giant hornet. Conn. Geol. Nat. Hist. Surv., Bull. 22, 641.

Vespula Thompson.

consobrina Saussure. **(Vespa).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 643.
diabolica Saussure. **(Dolichovespula).** *Vespa*. Common yellow jacket. *Ibid.*, Bull. 22, 642.
germanica Fabricius var. **pennsylvanica** Saussure. **(Vespa).** Common yellow jacket. *Ibid.*, Bull. 22, 643.
maculata Linnæus. **(Dolichovespula).** *Vespa*. White-faced hornet. *Ibid.*, Bull. 22, 642.
vulgaris Linnæus var. **communis** Saussure. *Vespa*. *Ibid.*, Bull. 22, 643.

Polistes Latreille.

annularis Linnæus. Conn. Geol. Nat. Hist. Surv., Bull. 22, 644.
pallipes LePeletier. Common wasp. *Ibid.*, Bull. 22, 644.
variatus Cresson. *Ibid.*, Bull. 22, 644.

Family AMPULICIDÆ.

Rhinopsis Westwood.

melanognathus Rohwer. Conn. Geol. Nat. Hist. Surv., Bull. 22, 652.

Family SPHECIDÆ.

Alyson Jurine.

oppositus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 654.

Nysson Latreille.

æqualis Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 655.
lateralis Packard. *Ibid.*, Bull. 22, 655.
tramosericus Viereck. *Ibid.*, Bull. 22, 655.

Paramellinus Rohwer.

bipunctatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 656.

Hoplisus LePeletier.

costalis Cresson. *Gorytes.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 657.
fuscus Taschenberg. *Gorytes.* *Ibid.*, Bull. 22, 656.
gracilis Patton. *Gorytes.* *Ibid.*, Bull. 22, 656.
nebulosus Packard. *Gorytes.* *Ibid.*, Bull. 22, 656.
phaleratus Say. *Gorytes.* *Ibid.*, Bull. 22, 656.

Psen Latreille.

cressoni Packard. **(Mimesa).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 659.
pauper Packard. **(Mimesa).** *Ibid.*, Bull. 22, 659.

Oxybelus Latreille.

quadrinotatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 659.

Notoglossa Dahlbom.

emarginata Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 660.

Anacrabro Packard.

ocellatus Packard. Conn. Geol. Nat. Hist. Surv., Bull. 22, 661. (S.N.D.)

Lindenius LePeletier.

errans Fox. Conn. Geol. Nat. Hist. Surv., Bull. 22, 664.

Rhopalum Kirby.

pedicellatum Packard. Conn. Geol. Nat. Hist. Surv., Bull. 22, 664.

Solenius LePeletier.

bigeminus Packard. **(Protothyreopus).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 668.

chrysargynus LePeletier. **(Hypocrabro).** *Ibid.*, Bull. 22, 669.
decemmaculatus Say. **(Hypocrabro).** *Ibid.*, Bull. 22, 669.
interruptus LePeletier. **(Solenius).** *Ibid.*, Bull. 22, 665.
obscurus Smith. **(Clytochrysus).** *Ibid.*, Bull. 22, 665.
producticollis Packard. **(Solenius).** *Ibid.*, Bull. 22, 666.
rufifemur Packard. **(Protothyreopus).** *Ibid.*, Bull. 22, 668.
sayi Cockerell. **(Xestocrabro).** *sexmaculatus.* *Ibid.*, Bull. 22, 667.
singularis Smith. **(Lophocrabro).** *Ibid.*, Bull. 22, 667. (W.F.)
stirpicola Packard. **(Hypocrabro).** *Ibid.*, Bull. 22, 668.

Crabro Fabricius.

advenus Smith. **(Synothyreopus).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 670.
æqualis Fox. **(Crabro).** *Ibid.*, Bull. 22, 670.
argus Packard. **(Crabro).** *Ibid.*, Bull. 22, 670.
oblongus Packard. *Ibid.*, Bull. 22, 662.
tumidus Packard. **(Synothreopus).** *Ibid.*, Bull. 22, 670.
unicus Patton. *Ibid.*, Bull. 22, 663.

Aphilanthops Patton.

frigidus Smith. Conn. Geol. Nat. Hist. Surv., Bull. 22, 672.

Philanthus Fabricius.

bilunatus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 673.
dubius Cresson. *Ibid.*, Bull. 22, 673.
politus Say. *Ibid.*, Bull. 22, 673.
punctatus Say. *Ibid.*, Bull. 22, 673.
sanbornii Cresson. *Ibid.*, Bull. 22, 673.
solivagus Say. *Ibid.*, Bull. 22, 673.

Trypoxylon Latreille.

clavatum Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 676.
excavatum Say. *Ibid.*, Bull. 22, 676.
frigidum Smith. *Ibid.*, Bull. 22, 676.
politum Say. *albitarse.* *Ibid.*, Bull. 22, 676.
tridentatum Packard. *Ibid.*, Bull. 22, 676.

Chlorion Latreille.

auripes Fernald. **(Isodontia).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 679.

bifoveolatum Taschenberg. **(Priononyx).** *Ibid.*, Bull. 22, 679.
cyaneum Dahlbom. var. **ærarium** Patton. **(Chlorion).** *Ibid.*, Bull. 22, 679.
harrisi Fernald. **(Isodontia).** *Ibid.*, Bull. 22, 679.
ichneumoneum Linnæus. **(Ammobia).** *Ibid.*, Bull. 22, 680.
pennsylvanicum Linnæus. **(Ammobia).** *Ibid.*, Bull. 22, 680.

Sphex Linnæus.

argentatus Hart. Bull. Ill. State Lab. Nat. Hist., vii, 266.
arvensis Dahlbom. Conn. Geol. Nat. Hist. Surv., Bull. 22, 682.
aureonotata Cameron. Biol. Centr. Amer., Hymenop., ii, 7.
nigricans Dahlbom. Psyche, x, 157.
procerus Dahlbom. Conn. Geol. Nat. Hist. Surv., Bull. 22, 682.

Sceliphron Klug.

cyaneum Klug. *Chalybion cœruleum.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 682.

Pelopæus Latreille.

cæmentarius Drury. Conn. Geol. Nat. Hist. Surv., Bull. 22, 682.

Lyroda Say.

subita Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 683.
triloba Say. *Ibid.*, Bull. 22, 683. (H.W.W.)

Notogonidea Rohwer.

argentata Beauvois. Conn. Geol. Nat. Hist. Surv., Bull. 22, 684.

Larropsis Patton.

distincta Smith. Conn. Geol. Nat. Hist. Surv., Bull. 22, 684.

Tachytes Panzer.

breviventris Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 686.
calcaratus Fox. *Ibid.*, Bull. 22, 686.
harpax Patton. *Ibid.*, Bull. 22, 686.

Tachysphex Kohl.

apicalis Fox. Conn. Geol. Nat. Hist. Surv., Bull. 22, 687.

Astata Latreille.

bicolor Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 688.
unicolor Say. *Ibid.*, Bull. 22, 688.

Stigmus Panzer.

americanus Packard. Conn. Geol. Nat. Hist. Surv., Bull. 22, 689.

Spilomena Shuckard.

pusilla Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 689.

Passalœcus Shuckard.

annulatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 689.

Pemphredon Latreille.

inornatus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 690.
tenax Fox. *Ibid.*, Bull. 22, 690.

Plenoculus Fox.

atlanticus Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 691.

Family BEMBECIDÆ.

Sphecius Dahlbom.

speciosus Drury. Conn. Geol. Nat. Hist. Surv., Bull. 22, 692.

Microbembex Patton.

monodonta Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 693.

Bicyrtes Le Peletier.
Bembidula Burmeister.

quadrifasciata Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 693.
ventralis Say. *Ibid.*, Bull. 22, 693.

Bembix Fabricius.

spinolæ LePeletier. Conn. Geol. Nat. Hist. Surv., Bull. 22, 694.

Family CERCERIDÆ.

Eucerceris Cresson.

zonatus Say. Proc. Ent. Soc. Phila. v, 105.

Cerceris Latreille.

clypeata Dahlbom. Conn. Geol. Nat. Hist. Surv., Bull. 22, 695.
compar Cresson. *Ibid.*, Bull. 22, 695.
dentifrons Cresson. *Ibid.*, Bull. 22, 696. (J.A.H.)
deserta Say. *Ibid.*, Bull. 22, 695.

fasciola Cresson. *Ibid.*, Bull. 22, 695.
fulvipediculata Schletterer. *Ibid.*, Bull. 22, 695.
fumipennis Say. *Ibid.*, Bull. 22, 695.
imitatoria Schletterer. *Ibid.*, Bull. 22, 695.
robertsoni Fox. *Ibid.*, Bull. 22, 695. (S.N.D.)

Family HALICTIDÆ.

Halictus Latreille.

albipennis Robertson. **(Chloralictus).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 702.
arcuatus Robertson. **(Evylæus).** Ibid., Bull. 22, 701.
cæruleus Robertson. **(Chloralictus).** *Ibid.*, Bull. 22, 702.
cephalicus Robertson. **(Paralictus).** *Ibid.*, Bull. 22, 701.
confusus Robertson. **(Oxystoglossa).** *Augochlora. Ibid.*, Bull. 22, 701.
coriaceus Smith. **(Lasioglossum).** *Ibid.*, Bull. 22, 700.
cressoni Robertson. **(Chloralictus).** *Ibid.*, Bull. 22, 702.
foxi Robertson. **(Evylæus).** *Ibid.*, Bull. 22, 701.
lerouxi LePeletier. **(Halictus).** *Ibid.*, Bull. 22, 701.
ligatus Say. **(Halictus.)** *Ibid.*, Bull. 22, 701.
marinus Crawford. **(Chloralictus).** Ent. News. 15, 99.
nymphæarum Robertson. **(Chloralictus).** *palustris.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 702.
obscurus Robertson. **(Chloralictus).** *Ibid.*, Bull. 22, 702.
pectoralis Smith. **(Evylæus).** *Ibid.*, Bull. 22, 701.
persimilis Viereck. **(Oxystoglossa).** *Augochlora. similis. Ibid.*, Bull. 22, 703.
pilosus Smith. **(Chloralictus).** *Ibid.*, Bull. 22, 701.
provancheri Dalla Torre. **(Halictus).** *fasciatus. Ibid.*, Bull. 22, 701.
purus Say. **(Augochlora).** *Oxystoglossa. Ibid.*, Bull. 22, 701. (H.W.W.)
quadrimaculatus Robertson. **(Evylæus).** *Ibid.*, Bull. 22, 701.
radiatus Say. **(Agapostemon).** *pulchra. Ibid.*, Bull. 22, 701.
sparsus Robertson. **(Chloralictus).** *Ibid.*, Bull. 22, 702.
splendens LePeletier. **(Agapostemon).** *Ibid.*, Bull. 22, 701.
tegularis Robertson. **(Chloralictus).** *Ibid.*, Bull. 22, 702.
truncatus Robertson. **(Evylæus).** *Ibid.*, Bull. 22, 701.

versatus Robertson. **(Chloralictus).** *Ibid.*, Bull. 22, 702.
vierecki Crawford. **(Chloralictus).** *nymphalis.* *Ibid.*, Bull. 22, 702.
virescens Fabricius. **(Agapostemon).** *nigricornis.* *viridulus* Authors. *Ibid.*, Bull. 22, 701.
viridissimus Viereck. **(Augochlora).** *viridula.* *Ibid.*, Bull. 22, 700.
zephyrus Smith. **(Chloralictus).** *Ibid.*, Bull. 22, 702.

Sphecodes Latreille.

arvensis Patton. **(Drepanium).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 708.
confertus Say. **(Drepanium).** *falcifer.* *Ibid.*, Bull. 22, 708.
mandibularis Cresson. **(Sphecodium).** *Ibid.*, Bull. 22, 708.
minor Robertson. **(Sphecodes).** *Ibid.*, Bull. 22, 708.

Family ANDRENIDÆ.

Andrena Fabricius.

arabis Robertson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 712.
asteris Robertson. *Ibid.*, Bull. 22, 713.
barbarica Viereck. Trans. Am. Ent. Soc., xliii, 369.
bisalicis Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 712.
braccata Viereck. *Ibid.*, Bull. 22, 713.
bradleyi Viereck. *Ibid.*, Bull. 22, 709.
canadensis Dalla Torre. *Ibid.*, Bull. 22, 712.
carlini Cockerell. *bicolor.* *Ibid.*, Bull. 22, 713.
claytoniæ Robertson. *Ibid.*, Bull. 22, 776.
cratægi Robertson. *Ibid.*, Bull. 22, 710.
cressoni Robertson. *Ibid.*, Bull. 22, 713.
erythrogastra Ashmead var. **rhodura** Cockerell. *Ibid.*, Bull. 22, 711.
flavoclypeata Smith. *bipunctata.* *Ibid.*, Bull. 22, 712.
forbesi Robertson. *Ibid.*, Bull. 22, 713.
fragilis Smith. *platyparis.* *Ibid.*, Bull. 22, 712.
geranii maculati Robertson. *Ibid.*, Bull. 22, 710.
hilaris Smith. *Ibid.*, Bull. 22, 713.
hippotes Robertson. *Ibid.*, Bull. 22, 713.
hirticincta Provancher. *americana.* *fimbriata.* *Ibid.*, Bull. 22, 710.

integra Smith. *lineata*. *Ibid.*, Bull. 22, 712.
krigiana Robertson. *Ibid.*, Bull. 22, 777. (E.J.S.M.)
mariæ Robertson var. **concolor** Robertson. *Ibid.*, Bull. 22, 713.
multiplicatiformis Viereck. *Ibid.*, Bull. 22, 714.
nasoni Robertson. *vestita*. *hartfordensis*. *Ibid.*, Bull. 22, 711.
nivalis Smith. *Ibid.*, Bull. 22, 711.
novæ-angliæ Viereck. *Ibid.*, Bull. 22, 711.
nubecula Smith. *Ibid.*, Bull. 22, 712.
obscura Robertson. *Ibid.*, Bull. 22, 714.
perplexa Smith var. **viburnella** Grænicher. *Ibid.*, Bull. 22, 712.
placida Smith. *macgillivrayi*. *Ibid.*, Bull. 22, 711.
pruni Robertson. *dunningi*. *Ibid.*, Bull. 22, 712.
robertsoni Dalla Torre. *serotina*. *Ibid.*, Bull. 22, 712.
rugosa Robertson. *Ibid.*, Bull. 22, 714.
salictaria Robertson. *Ibid.*, Bull. 22, 711.
solidaginis Robertson. *Ibid.*, Bull. 22, 712.
spireana Robertson. *Ibid.*, Bull. 22, 714.
thaspii Grænicher. *mandibularis*. *Ibid.*, Bull. 22, 713.
vicina Smith. *Ibid.*, Bull. 22, 713.
victima Smith. *Ibid.*, Bull. 22, 715.
weedi Viereck. *Ibid.*, Bull. 22, 714.
wilkella Kirby. *winkleyi* Viereck. *Ibid.*, *Bull.* 22, 712.
ziziæ Robertson. *Ibid.*, Bull. 22, 712.
ziziæformis Cockerell. Can. Ent., 49, 234.

Family DUFOUREIDÆ.

Halictoides Nylander.

novæangliæ Robertson. **(Conohalictoides).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 720.

Family MACROPIDÆ.

Macropis Panzer.

ciliata Patton. Conn. Geol. Nat. Hist. Surv., Bull. 22, 720.
patellata Patton. *Ibid.*, Bull. 22, 720.

Family PANURGIDÆ.

Perdita Smith.

novæangliæ Viereck. Conn. Geol. Nat. Hist. Surv., Bull. 22, 721.
octomaculata Say. *Cockerellia*. *Ibid.*, Bull. 22, 721.

Panurginus Nylander.

asteris Robertson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 721.
parvus Robertson. *Ibid.*, Bull. 22, 721.

Calliopsis Smith.

andreniformis Smith. Conn. Geol. Nat. Hist. Surv., Bull. 22, 722.

Family NOMADIDÆ.

Nomada Fabricius.

americana Kirby. **(Centrias).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 723.
cuneata Robertson. **(Gnathias).** *Ibid.*, Bull. 22, 726.
denticulata Robertson. *Ibid.*, Bull. 22, 725.
illinoiensis Robertson. *Ibid.*, Bull. 22, 724. (H.W.W.)
imbricata Smith. **(Holonomada).** *Ibid.*, Bull. 22, 724.
incerta Cresson. **(Centrias).** *Ibid.*, Bull. 22, 724.
obliterata Cresson. **(Heminomada).** *Ibid.*, Bull. 22, 725.
pygmæa Cresson. *Ibid.*, Bull. 22, 726.
sayi Robertson. *Ibid.*, Bull. 22, 725.
vicina Cresson. *Ibid.*, Bull. 22, 724.

Epeoloides Giraud.

Viereckella Swenk.

pilosula Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 727. (E.L.D.)

Epeolus Latreille.

pusillus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 728.

Triepeolus Robertson.

donatus Smith. Conn. Geol. Nat. Hist. Surv., Bull. 22, 729.
lunatus Say. *Ibid.*, Bull. 22, 730.

Holcopasites Ashmead.

Neopasites Ashmead.

illinoiensis Robertson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 730.

Family EUCERIDÆ.

Mellissodes Latreille.

bimaculata LePeletier. Conn. Geol. Nat. Hist. Surv., Bull. 22, 731.
dentiventris Smith. *Ibid.*, Bull. 22, 732.
desponsa Smith. *Ibid.*, Bull. 22, 732.
perplexa Cresson. *Ibid.*, Bull. 22, 732.
rustica Say. *Ibid.*, Bull. 22, 731.

Tetralonia Spinola.

atriventris Smith. *Synhalonia.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 733.

Xenoglossa Smith.

pruinosa Say. **(Peponapis).** Conn. Geol. Nat. Hist Surv., Bull. 22, 733.

Family ANTHOPHORIDÆ.

Anthophora Latreille.

floridana Smith. **(Emphoropsis).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 735.
terminalis Cresson. **(Clisodon).** *Ibid.*, Bull. 22, 736.

Family HYLÆIDÆ.

Hylæus Fabricius.

Prosopis Fabricius.

ellipticus Cockerell. Conn. Geol. Nat. Hist. Surv., Bull. 22, 737.
modestus *Say. affinis. Ibid.*, Bull. 22, 738.
pygmæus Cockerell. *Ibid.*, Bull. 22, 737.
saniculæ Robertson. Can. Ent., xxxvi, 273.
ziziæ Robertson. *Ibid.*, Bull. 22, 737.

Family COLLETIDÆ.

Colletes Latreille.

æstivalis Patton. Conn. Geol. Nat. Hist. Surv., **Bull.** 22, 740.
compactus Cresson. *Ibid.*, Bull. 22, 739.

inæqualis Say. *Ibid.*, Bull. 22, 739.
validus Cresson. *Ibid.*, Bull. 22, 740.
sp. *Ibid.*, Bull. 22, 741.

Family STELIDIDÆ.

Stelis Panzer.

fœderalis Smith. **(Microstelis).** *nitida.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 741.
lateralis Cresson. **(Microstelis).** *Ibid.*, Bull.. 22, 741.

Family MEGACHILIDÆ.

Megachile Latreille.

brevis Say. **(Megachile).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 743.
exclamans Viereck. **(Xanthosarus).** Ibid., Bull. 22, 743.
infragilis Cresson. **(Anthemois).** *Ibid.*, Bull. 22, 743.
latimana Say. **(Xanthosarus).** *femoratus.* *Ibid.*, Bull. 22, 744.
mendica Cresson. **(Megachile).** *Ibid.*, Bull. 22, 745.
vidua Smith. **(Delomegachile).** *frigida.* *Ibid.*, Bull. 22, 743. (H.W.W.)

Cœlioxys Latreille.

dubitata Smith. *rufitarsis.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 746.
dubitata var. **melanopoda** Viereck. *Ibid.*, Bull. 22, 747.
mœsta Cresson. *Ibid.*, Bull. 22, 746.
octodentata Say. *Ibid.*, Bull. 22, 747.
sayi Robertson. *Ibid.*, Bull. 22, 747.

Osmia Panzer.

albiventris Cresson. **(Leucosmia).** Conn. Geol. Nat. Hist. Surv., Bull. 22, 749.
atriventris Cresson. **(Osmia).** *Ibid.*, Bull. 22, 749.
conjuncta Cresson. **(Diceratosmia).** *Ibid.*, Bull. 22, 748.
distincta Cresson. **(Nothosmia).** *Ibid.*, Bull. 22, 748.
lignaria Say. **(Ceratosmia).** *Ibid.*, Bull. 22, 748.
major Robertson. **(Osmia).** *Ibid.*, Bull. 22, 749.
pumila Cresson. **(Osmia).** *Ibid.*, Bull. 22, 749.
purpurea Cresson. **(Osmia).** Ibid., Bull. 22, 748.
rustica Cresson. **(Osmia).** *Ibid.*, Bull. 22, 749. (H.W.W.)

Andronicus Cresson.

cylindricus Cresson. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 751.
pilosifrons Cresson. **(Alcidamea).** *Ibid.,* Bull. *22*, 751.
productus Cresson. **(Alcidamea).** *Ibid.,* Bull. *22*, 751.
truncatus Cresson. **(Alcidamia).** *Ibid.,* Bull. *22*, 751.

Heriades Spinola.

carinatus Cresson. **(Trypetes).** Conn. Geol. Nat. Hist. Surv., Bull. *22*, 751.

Dianthidium Cockerell.

notatum Latreille. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 752.
simile Cresson. *Ibid.,* Bull. *22*, 752.

Family CERATINIDÆ.

Ceratina Latreille.

dupla Say. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 753.
metallica H. S. Smith. *Ibid.,* Bull. *22*, 753.

Family XYLOCOPIDÆ.

Xylocopa Latreille.

virginica Drury. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 753.

Family APIDÆ.

Bremus Panzer.

Bombus Latreille.

affinis Cresson. Conn. Geol. Nat. Hist. Surv., Bull. *22*, 755.
bimaculatus Cresson. *Ibid.*, Bull. *22*, 757.
fervidus Fabricius. *Ibid.,* Bull. *22*, 755.
impatiens Harris. *virginicus*. *Ibid.*, Bull. *22*, 756.
pennsylvanicus DeGeer. *americanorum* DeGeer. *Ibid.,* Bull. *22*, 755.
perplexus Cresson. *Ibid.*, Bull. *22*, 756.
ternarius Say. *Ibid.*, Bull. *22*, 756.
terricola Kirby. *Ibid.,* Bull. *22*, 755.
vagans Smith. *Ibid.,* Bull. *22*, 755.
vagans var. **consimilis** Cresson. *Ibid.,* Bull. *22*, 756.

Bombias Robertson.

auricomus Robertson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 758. (H.W.W.)

separatus Cresson. *Ibid.*, Bull. 22, 758.

Psithyrus LePeletier.

ashtoni Cresson. Conn. Geol. Nat. Hist. Surv., Bull. 22, 759.

laboriosus Fabricius. *citrinus*. *Ibid.*, Bull. 22, 759.

laboriosus var. **contiguus** Cresson. *Ibid.*, Bull. 22, 760.

variabilis Cresson. *Ibid.*, Bull. 22, 759.

Apis Linnæus.

mellifera Linnæus. *mellifica*. Honey bee. Conn. Geol. Nat. Hist. Surv., Bull. 22, 760.

APPENDIX

After the list was set up in type and arranged in the preceding pages, a number of additional genera and species were recognized or were reported from Connecticut material. Some of these additions have been included in the pages where they belong, but others cannot be inserted without entirely rearranging the matter on many pages. It has also seemed necessary to use certain references which are not explained in the Key on page 13; these references and the additional genera and species are given in the following pages: —

KEY TO ADDITIONAL REFERENCES

(See Page 13.)

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Long's Exp.— Narrative of an Expedition to the Source of St. Peter's River, &c, 1824, Appendix. (Usually cited as Long's Expedition.)

Mon. Bupr.— Monograph of the Buprestidæ, from Histoire Naturelle et Iconographie des Coleopteres, by F. L. de Laporte and H. Gory, Paris, 1835-1841.

Mon. Hister.— Essai monographique sur la famille des Histerides, by S. A. de Marseul. Annals de la Société Entomologique de France, Series 3, 1853 — Series 4, 1862, Paris.

Penn. Bur. Pl. Ind.— Pennsylvania Bureau of Plant Industry, Technical Series, Bulletin No. 1, by J. G. Sanders and D. M. DeLong. Harrisburg, Pa., 1920.

Ins.— Species Insectorum, by J. C. Fabricius, 2 volumes, 1781.

Ins.— Synomymia Insectorum, by C. J. Schoenherr, 4 parts and Supplement, Stockholm and Skara, 1806-1817.

State Bd. Ent.— Tennessee State Board of Entomology, Bulletin 17, The Leafhoppers or Jassoidea of Tennessee, by Dwight M. DeLong, Knoxville, Tem., 1916.

lüg. Ins.— Zweiflügeligen Insekten Systematische Beschreibung der bekannten Europäischen, by Johann Wilhelm Meigen, 7 volumes, Achen and Hamm, 1818-1838.

ADDITIONS TO CHECK LIST

The following species have been recorded from Connecticut and should be added to the list given on the foregoing pages: —

Order ODONATA.

Family AGRIONIDÆ.

(See page 33.)

Argia Rambur.

translata Hagen. Biol. Centr. Am., Neuroptera, 76, 1901.

Family LIBELLULIDÆ.

(See page 35)

Somatochlora Selys.

(See page 36)

linearis Hagen. Trans. Am. Ent. Soc., xx, 253.

Order HEMIPTERA.

Family CICADELLIDÆ.

(See page 47)

Idiocerus Lewis.

cognatus Fieber. Ent. Am., vi, 226.
duzeei Provancher. *perplexus* Gillette and Baker. Hemip. Col., 78.

Macropsis Lewis.

gleditschiæ Osborn and Ball. *Pediopsis*. Tenn. State Bd. Ent., Bull. 17, 16.

Oncopsis Burmeister.

pruni Provancher. Me. Agr. Expt. Sta., Bull. 238, 87.

Aucucephalus Germar.

nervosus Schrank. *striatus* Linnæus. Me. Agr. Expt. Sta., Bull. 238, 107.

Xestocephalus Van Duzee.

pulicarius Van Duzee. Tenn. State Bd. Ent., Bull. 17, 35.
superbus Provancher. *fulvocapitatus* Van Duzee. *Ibid.*, Bull. 17, 35.

Parabolocratus Fieber.

major Osborn. Me. Agr. Expt. Sta., Bull. 238, 110.

Platymetopius Burmeister.

fulvus Osborn. Rept. N. Y. State Ent., 20, 519.

Deltocephalus Burmeister.

areolatus Ball. Can. Ent., xxxi, 188.

Euscelis Brullé.

Athysanus.

cuneatus Sanders and DeLong. Penn. Bur. Pl. Ind., Tech. Bull. 1, 17.
parallelus Van Duzee. Can. Ent., xxiii, 169.

Gypona Germar.

pectoralis Spangberg. *albimarginata* Woodworth. *hullensis* Provancher. Proc. U. S. Nat. Mus., 56, 94.

Thamnotettix Zetterstedt.

inornatus Van Duzee. Tenn. State Bd. Ent., Bull. 17, 81.
morsei Osborn. Me. Agr. Expt. Sta., Bull. 238, 134.

Cicadula Zetterstedt.

lepida Van Duzee. Tenn. State Bd. Ent., Bull. 17, 94.
slossoni Van Duzee. Can. Ent., xxv, 281.

Empoasca Walsh.

aureo-viridis Uhler. Tenn. State Bd. Ent., Bull. 17, 100.
obtusa Walsh. *Ibid.*, Bull. 17, 100.

Erythroneura Fitch.

obliqua Say var. **dorsalis** Gillette. Tenn. State Bd. Ent., Bull. 17, 105.
trifasciata Say. *Ibid.*, Bull. 17, 106.
vitis Harris var. **stricta** McAtee. Trans. Am. Ent. Soc., xlvi, 305.

Family MEMBRACIDÆ.

(See page 53)

Acutalis Fairmaire.

tartarea Say. Bull. Buff. Soc. Nat. Sci., ix, 51.

Achasia Stål.

belfragei Stål. Bull. Buff. Soc. Nat. Sci., ix, 73.

Family MIRIDÆ.

Phytocoris Fallen.

(See page 71)

buenoi Knight. Bull. Brook. Ent. Soc., xv, 57.
conspurcatus Knight. *Ibid.*, xv, 61.
corticevivens Knight. *Ibid.*, xv, 63.
penipectus Knight. *Ibid.*, xv, 58.
salicis Knight. *Ibid.*, xv, 56.
sulcatus Knight. *Ibid.*, xv, 64.

Order **LEPIDOPTERA.**

Family GLYPHIPTERYGIDÆ.

(Belongs near Tortricidæ, see page 96)

Hemerophila Hubner.

pariana Clerck. *Simæthis.* Apple and thorn skeletonizer. Re[p]
N. Y. State Ent., 33, 33.

Family TORTRICIDÆ.

(See page 96.)

Olethreutes Hübner.

(See page 97)

hemidesma Zeller. Rept. Conn. Agr. Expt. Sta., 1917, 364, [p]
xxxi, b.

Family PYRALIDÆ

(See page 103)

Acrobasis Zeller.

(See page 109)

demotella Grote. Wash. Ent. Soc., x, 41.

Order **DIPTERA.**

Family CECIDOMYIDÆ (ITONIDIDÆ).

(See page 168)

Diarthronomyia Felt.

hypogæa Loew. Chrysanthemum gall midge. Rept. Conn. Agr. Expt. Sta., 1919, 161, pl. xxxi.

Cincticornia Felt.

(See page 169)

pillulæ Walsh and Riley. N. Y. State Mus. Bull., 200, 90.

Caryomyia Felt.

(See page 169)

holotricha Osten Sacken. N. Y. State Mus. Bull., 200, 47.

Family SCATOPSIDÆ.

(See page 171)

Ectætia Enderlein.

clavipes Loew. *Scatopse.* Linn. Ent., i, 333. (H.L.J.)

Family SYRPHIDÆ.

(See page 184)

Xylota Meigen.

(See page 188)

tuberans Williston. Syn. N. A. Syrph., 225.

Family TACHINIDÆ.

(See page 190)

Tachina Meigen.

(See page 194)

simulans Meigen. Zweiflüg. Ins., iv, 306.

Family SCIOMYZIDÆ.

(See page 201)

Limnia Desvoidy.

boscii Desvoidy. Ann. Ent. Soc. Am., xiii, 323.

Tetanocera Dumeril

elata Fabricius. Ann. Ent. Soc. Am., xiii, 328.
rotundicornis Loew. *Ibid.,* xiii, 328.
vicina Macquart. *Ibid.,* xiii, 327.

Order **COLEOPTERA.**

Family DYTISCIDÆ.

Deronectes Sharp.
(See page 220)

griseostriatus DeGeer. Coleop. Ind., 216. (K.F.C.)

Hydroporus Clairville.
(See page 220)

spurius LeConte. Proc. Acad. Nat. Sci., 1855, 296. (K.F.C.)

Family HYDROPHILIDÆ.

Hydrobius Leach.
(See page 223)

tessellatus Ziegler. Coleop. Ind., 263. (K.F.C.)

Family LAMPYRIDÆ.

(See page 234)

Photinus Laporte.

marginellus LeConte. Trans. Am. Ent. Soc., ix, 35.

Family ELATERIDÆ.

Melanotus Eschscholtz.
(See page 242)

castanipes Paykull. Coleop. Ind., 746.
depressus Melsheimer. *Ibid.*, 755.
sp. near **sagittarius** LeConte.

Family EROTYLIDÆ.

(See page 251)

Mycotretus Lacordaire.

pulchra Say. Trans. Am. Ent. Soc., iv, 354.

Family TENEBRIONIDÆ.

(See page 257)

Scaphidema Redtenbacher.

æneolum LeConte. Coleop. Ind., 1265.

Family MELANDRYIDÆ.

(See page 259)

Serropalpus Hellwig.

barbatus Scholl. Illus. Besttabl. Kaf. Deutsch., 727.

Eustrophinus Seidletz (See page 259)

tomentosus Say. Coleop. Ind., 1293. (K. F. C.)

Family SCARABÆIDÆ.

Aphodius Illiger.

(See page 262)

hæmorrhoidalis Linnæus. Syst. Nat., 1, 348.

Family CERAMBYCIDÆ.

(See page 266)

Leptostylus LeConte.

(See page 270)

aculiferus Say. Trans. Am. Ent. Soc., viii, 121.

Oberea Mulsant.

(See page 272)

tripunctata Swederus var. **myops** Haldeman. Trans. Am. Ent. Soc., vii, 47.

Family CHRYSOMELIDÆ.

Diabrotica Chevrolat.

(See page 277)

longicornis Say. Coleop. Ind., 1172. (K.F.C.)

Family CURCULIONIDÆ.

Acanthoscelis Dietz.

(See page 286)

curtus Say. Rhyn. N. E. Am., 431. (K.F.C.)

Ceutorhynchus Germar (See page 287)

semirufus LeConte. Rhyn. N. E. Am., 451. (K.F.C.)

Order **HYMENOPTERA.**

Family TENTHREDINIDÆ.

(See page 292)

Hemichroa Stephens.

dyari Rohwer. Proc. Wash. Ent. Soc., xx, 171

Trichiocampus Hartig (See page 297.)

gregarius Dyar. *Cladius gregarius.* Conn. Geol. Nat. Hist. Surv., Bull. 22, 110.

irregularis Dyar. *Priophorus irregularis.* Journ. N. Y. Ent. Soc., viii, 28.

Pteronidea Rohwer.

(See page 298)

alnivora Rohwer. Proc. U. S. Nat. Mus., lvii, 213.

Kaliofenusa MacGillivray.

(Belongs near **Erythraspides,** page 299)

ulmi Sundewall. Elm leaf-miner. Conn. Geol. Nat. Hist. Surv. Bull. 22, 157.

Family BRACONIDÆ.

(See page 305)

Cyanopterus Wesmael.

sp.

Family ICHNEUMONIDÆ.

Campoplex Gravenhorst.

(See page 309)

validus Cresson. *Limnerium validum. Mesoleptus.* Proc. Ent. Soc. Phila., iii, 258.

Arotes Gravenhorst.

(See page 315)

decorus Say. Conn. Geol. Nat. Hist. Surv., Bull. 22, 326.

Family EULOPHIDÆ.

(See page 323)

Dimmockia Ashmead.

incongrua Ashmead. *Eulophus.* Proc. Wash. Ent. Soc., iv, 158.

Family CHALCIDIDÆ.

(See page 326)

Rhopalicus Fœrster.

ɔensus Ratzeburg. *Pteromalus.* Ichneumon. d. Forstins., i, 189.

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State of Connecticut

PUBLIC DOCUMENT No. 47

State Geological and Natural History Survey

HERBERT E. GREGORY, SUPERINTENDENT

BULLETIN NO. 32

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State Geological and Natural History Survey

COMMISSIONERS

Publication Approved by the Board of Control

PRESS OF
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NEW HAVEN, CONN.

NINTH BIENNIAL REPORT OF THE COMMISSIONERS

OF THE

State Geological and Natural History Survey of Connecticut

1919-1920

HARTFORD
Published by the State
1920

LETTER OF TRANSMITTAL

NEW HAVEN, CONN., December 30, 1920.

HIS EXCELLENCY, MARCUS H. HOLCOMB,
Governor of Connecticut,
Hartford, Connecticut.

Sir:—I have the honor to transmit to you herewith, in behalf of the Commissioners of the State Geological and Natural History Survey, the report of the Superintendent of the work, covering the two years ending December 31, 1920.

Very respectfully,

HERBERT E. GREGORY,
Acting Secretary of the Commission.

NINTH BIENNIAL REPORT OF THE GEOLOGICAL AND NATURAL HISTORY SURVEY OF CONNECTICUT

SCOPE AND PLAN OF THE STATE SURVEY.

The act of 1903 establishing the Survey proposed two subjects for investigation, viz, the geology of the State, and the natural history, or botany and zoology, of the State. It has been presumed to be the intent of the law that the appropriation should be divided with some approach to equality between geology and biology. The law further specifies three aims with reference to which the work should be prosecuted: first, the purely scientific aim of advancing our knowledge of the geology and natural history of the State; second, the economic aim of leading to the most effective conservation and utilization of the resources of the State; third, the educational aim of promoting the work of the schools of the State by the publication of the results of investigation in a form adapted for the use of teachers.

The plan of organization which was outlined in the first report has been retained. Only one salaried officer has been appointed by the Commissioners, viz, the Superintendent. Other scientific men have been engaged to investigate particular subjects and prepare reports or bulletins thereon.

The contracts made with these scientific men provide for an allotment for actual and necessary field expenses and for a small monthly salary during the time the investigator is at work in the field. For manuscript reports prepared without expense to the State, a small honorarium is paid to their authors. In making new contracts it is the policy of the Superintendent to include an agreement as to the date at which the completed report is to be submitted and to discontinue allotments for projects on which no work has been done for several years.

Each report is published as a separate bulletin, the bulletins being numbered consecutively, generally in the order in which they are received. Each bulletin bears the name of the author or the names of the authors, and each author is responsible for his own work. The bulletins are issued in paper covers, but a part of the edition is reserved for binding. Bulletins 1 to 5 have been bound as Volume I, Bulletins 6 to 12 as Volume II, Bulletins 13 to 15 as Volume III, Bulletins 16 to 21 as Volume IV, and Bulletin 22 as Volume V. The bound volumes are especially desirable for public libraries and similar institutions, in which complete sets of our publications are to be preserved. The pamphlet form, in

which each bulletin is complete in itself, is convenient for the large number of students, teachers, and others who have use for some particular bulletin. The publications of the Survey are distributed by the State Librarian. They are given liberally to colleges, public libraries, geological surveys, and other scientific institutions, and to scientific men of repute in the branches of science with which the respective bulletins are concerned. In many cases, books and papers of great value are received in exchange for the publications of the Survey. All books and papers thus received are deposited in the State Library. The publications of the Survey are also distributed liberally to citizens of our own State, particularly to teachers who can make use of them in their work. In the case of persons who are not known as scientific men, and who appear to have no special claim for the donation of the publications of the Survey, the bulletins are sold at prices sufficient to cover the cost of printing and transportation.

Bulletins Published.

The Survey has already published the following bulletins:

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904, 18 pp., 1904.
2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut, by H. W. Conn, 69 pp., 34 pls., 1905.
3. A Preliminary Report on the Hymeniales of Connecticut, by E. A. White, 81 pp., 40 pls., 1905.
4. The Clays and Clay Industries of Connecticut, by G. F. Loughlin, 121 pp., 13 pls., 1 fig., 1905.
5. The Ustilagineæ, or Smuts, of Connecticut, by G. P. Clinton, 45 pp., 7 pls., 1905.
6. Manual of the Geology of Connecticut, by W. N. Rice and H. E. Gregory, 273 pp., 31 pls., 22 figs., 1906.
7. Preliminary Geological Map of Connecticut, by H. E. Gregory and H. H. Robinson, 39 pp., 1 map, 1 fig., 1907.
8. Bibliography of Connecticut Geology, by H. E. Gregory, 123 pp., 1907.
9. Second Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906, 23 pp., 1906.
10. A Preliminary Report on the Algæ of the Fresh Waters of Connecticut, by H. W. Conn and L. W. (Hazen) Webster, 78 pp., 44 pls., 1908.
11. The Bryophytes of Connecticut, by A. W. Evans and G. E. Nichols, 203 pp., 1908.
12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908, 30 pp., 1908.
13. The Lithology of Connecticut, by Joseph Barrell and G. F. Loughlin, 207 pp., 6 tables, 1910.
14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation, by a Committee of the Connecticut Botanical Society, 569 pp., 1910.
15. Second Report on the Hymeniales of Connecticut, by E. A. White, 70 pp., 28 pls., 1910.

16. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part I. General Introduction, by W. E. Britton. Part II, The Euplexoptera and Orthoptera of Connecticut, by B. H. Walden, 169 pp., 11 pls., 66 figs., 1911.

17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-1910, 31 pp., 1910.

18. Triassic Fishes of Connecticut, by C. R. Eastman, 77 pp., 11 pls., 8 figs., 1911.

19. Echinoderms of Connecticut, by W. R. Coe, 152 pp., 32 pls., 29 figs., 1912.

20. The Birds of Connecticut, by J. H. Sage and L. B. Bishop, assisted by W. P. Bliss, 320 pp., 1913.

21. Fifth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1911-1912, 27 pp., 1912.

22. Guide to the Insects of Connecticut, prepared under the direction of W. E. Britton. Part III, The Hymenoptera, or Wasp-like Insects of Connecticut, by Henry Lorenz Viereck, in collaboration with A. D. MacGillivray, C. T. Brues, W. M. Wheeler, and S. A. Rohwer, 824 pp., 10 pls., 15 figs., 1916.

23. Central Connecticut in the Geologic Past, by Joseph Barrell, 44 pp., 9 figs., 1915.

24. Triassic Life of the Connecticut Valley, by R. S. Lull, 285 pp., 12 pls., 3 maps, 126 figs., 1 section, 1915.

25. Sixth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1913-1914, 24 pp., 1915.

26. The Arthrostraca of Connecticut, by Beverly Waugh Kunkel, 261 pp., 84 figs., 1918.

27. Seventh Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1915-1916, 17 pp., 1917.

28. Eighth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1917-1918, 21 pp., 1919.

29. The Quarternary Geology of the New Haven Region, Connecticut, by Freeman Ward, 80 pp., 9 pls., 17 figs., 1920.

30. Drainage Modifications and Glaciation in the Danbury Region, Connecticut, by Ruth Sawyer Harvey, 59 pp., 5 pls., 10 figs., 1920.

31. Check-List of the Insects of Connecticut, by Wilton Everett Britton, 397 pp., 1920.

Interest in these publications and their usefulness to the people of Connecticut is indicated to some degree by the number of requests for copies. The following summary is furnished by the State Librarian:

Bulletin	Date issued	Number of copies printed	Number of copies now on hand
1	1904	3,000	17
2	1905	3,500	Out of print
3	1905	3,500	180
4	1905	3,500	275
5	1905	3,500	450
6	1906	4,000	Out of print
7	1907	3,500	50
8	1907	3,500	500
9	1906	3,000	575
10	1908	3,500	580
11	1908	3,000	520

Bulletin	Date issued	Number of copies printed	Number of copies now on hand
12	1908	3,000	19
13	1910	3,500	875
14	1910	4,000	1,550
15	1910	3,500	950
16	1911	3,500	375
17	1910	3,000	610
18	1911	3,500	960
19	1912	3,500	2,020
20	1913	4,500	1,250
21	1912	3,000	650
22	1916	3,500	1,150
23	1915	4,000	1,250
24	1915	4,000	1,134
25	1915	2,900	275
26	1918	3,000	1,002
27	1917	2,900	1,010
28	1919	2,500	200
29	1920	2,500	Not yet distributed
30	1920	2,500	" " "
31	1920	3,000	" " "

Vol. I	600 copies of each bulletin as listed above used for binding	262
" II		202
" III		278
" IV		312
" V		402

The editions of Bulletins 2 and 6 are exhausted for distribution purposes, as is also the Geological Map mounted for use on walls, accompanying Bulletin 7. The State Librarian remarks that on account of the constant demand for these three Bulletins, 2, 6 and 7, they might with profit be re-published.

Copies of all bulletins may still be obtained in bound volumes.

The publications made in cooperation with the United States Geological Survey are given on pages 12-14.

That the publications of the Survey are serving their purpose is indicated by laudatory reviews and by many letters of commendation. The following is an illustration:

> "We consider that this [Bulletin 22] is one of the most valuable memoirs on the Hymenoptera that has been published on this continent, and systematic workers are finding it most useful."—Canadian Department of Agriculture.

Since the last Biennial Report, Bulletins 29 and 30 have been published. Bulletin 31 is now in press. Bulletin 29, the Quarternary Geology of the New Haven Region, Connecticut, by Freeman Ward, consists of a discussion of the preglacial, glacial, and postglacial conditions of the New Haven region, together with a description of soils and of natural scenery.

Bulletin 30, Drainage Modifications and Glaciation in the Danbury Region, Connecticut, by Miss Ruth Sawyer Harvey, is a discussion of the streams in the Central Housatonic Basin.

A general description of the region centering at Danbury is given from a geological standpoint.

Bulletin 31, Check-List of the Insects of Connecticut, by Wilton Everett Britton, will be of value to institutions as well as to individuals in the identification of insects in the State. As Mr. Britton has been assisted in his work of records and identification of species by collectors and specialists in entomology in and near Connecticut, the list, though necessarily incomplete, is believed to be accurate. To quote from the preface of Bulletin 31:

> "The purpose of this list is to stimulate an interest in the collection and study of insects in the State, as has been done in New Jersey, and to serve as a check-catalogue of the species in the collections of the institutions and amateur collectors. A work entitled "Guide to the Insects of Connecticut," containing keys to orders, families, genera, and species, and including much information about life-histories, habits, distribution, etc., is already in progress; two papers, the Euplexoptera and Orthoptera, by B. H. Walden, and the Hymenoptera, by Henry L. Viereck, having already been published as Bulletins 16 and 22 of this Survey. It will be many years at least before the Guide can be finished so as to include all orders of insects, and the usefulness of a check-list for service during this time seemed to warrant its preparation and publication."

Unpublished Manuscripts.

A paper on the Geology of the Stonington-Westerly region, Connecticut and Rhode Island, has been prepared by Miss Laura Hatch, and accepted for publication. Its aim is to give a complete geologic and physiographic description of a region which contains type physiographic and petrographic features.

A paper has been prepared on the Geology of the Guilford (Connecticut) Quadrangle by Wilbur G. Foye. This report represents a study of igneous and metamorphic rocks of this area as bearing on the geologic history of the State.

It is expected that the manuscripts of the following bulletins will be received during the coming year:

Hemiptera of Connecticut. Fifteen zoologists, under the direction of W. E. Britton, have contributed to the preparation of this bulletin which will have over 800 printed pages. Except for slight revision, this work is complete.

The Decapods of Connecticut, by A. E. Verrill. The introduction and the systematic portion have been completed, making over 200 printed pages, and 111 illustrations have been prepared. A bibliography is to accompany the report, which otherwise is practically complete.

The Vegetation of Connecticut, by George E. Nichols. The field work on which this bulletin is based has been completed and some progress made with the preparation of the manuscript. The scope of this work, authorized by the Commissioners in December, 1917, is indicated in Bulletin 28, page 18, 1919.

Cooperation with the United States Geological Survey.

During the years 1911 to 1917 the State Geological and Natural History Survey cooperated with the United States Geological Survey in a study of the water resources of Connecticut. During this time, 69 towns, which comprise 35 per cent of the area of the State and include 50 per cent of its population, were surveyed. The list of towns covered by this investigation is given in Bulletin 27, page 13, of the State Survey. Further work was discontinued on June 30, 1917, for the duration of the war. In 1919, cooperative work was again undertaken and a study made by Mr. John S. Brown of the underground water resources of the region bordering Long Island Sound.

By the terms of the contract, the United States Geological Survey assumed responsibilty for the prosecution of the work, and Herbert E. Gregory, Geologist of the Federal Survey, was appointed to direct the investigations. The purpose of the series of studies is to determine the position, amount, and quality of the waters—particularly underground waters—of the State of Connecticut and to discuss their economic utilization. The value of such studies depends upon their usefulness, not only to communities using a common supply, but to individual landholders, and the preparation of reports has, therefore, involved detailed mapping and local descriptions. The position of ground water with reference to the land surface has been determined; areas of open field, forest, rock, and types of glacial soil have been outlined; water from springs, wells, and brooks has been analyzed; and studies of the most economical and sanitary supplies for farms and villages have been made. By description and discussion in the text, by tabulation of statistics and representation of data on maps and sections, the conclusions of the authors regarding amount, quality, and availability of water supply of each town are given.

By agreement, the results of these investigations of the water resources of Connecticut are to be published as water-supply papers of the United States Geological Survey, and the expense of publication is to be met by the Federal Treasury. Each water-supply paper will bear the title: "Prepared in Cooperation with the Connecticut Geological and Natural History Survey," and the contract reserves the right of the State of Connecticut to publish or republish all or parts of the reports.

The following publications have appeared:

Ground Water in the Hartford, Stamford, Salisbury, Willimantic, and Saybrook Areas, Connecticut, by H. E. Gregory and A. J. Ellis. Water-Supply Paper 374, 1916. 150 pp., 13 pls., 10 figs.

Ground Water in the Waterbury Area, Connecticut, by A. J. Ellis. Water-Supply Paper 397, 1916. 73 pp., 4 pls., 10 figs.

Water-Supply Paper 374 represents the first systematic attempt to investigate the ground water in the State. The area described covers 715 square miles and includes the towns of Hartford, West Hartford, Newington, Wethersfield, East Hartford, Manchester, Windsor, East Windsor, South Windsor, Bloomfield, Stamford, Greenwich, Salisbury, Canaan, North Canaan, Windham, Franklin, Saybrook, Essex, Westbrook, and Old Lyme. The aim of the paper is to show how much water is stored underground, how the supply fluctuates, what its quality is, how it can be procured, and how much can be secured from streams.

Water-Supply Paper 397 covers work on an area of about 171 square miles, and includes the towns of Ansonia, Seymour, Oxford, Beacon Falls, Naugatuck, Middlebury, Waterbury, Watertown, Thomaston. This region is rich in good water-power sites and well provided with water for municipal supplies, but the conflicting demands of water users have given rise to local problems of conservation. This report records facts and recommendations on which regulations for the use of water may be based.

These publications, and also Water-Supply Paper 232, by H. E. Gregory, Underground Water Resources of Connecticut, which deals with the State as a whole, may be obtained free of charge from the Director, United States Geological Survey, Washington, D. C.

The call for these studies of water resources of the State is somewhat greater than for many similar public documents. The first edition of Water-Supply Paper 232, issued in 1909, was exhausted and of the second printing, 228 copies were in stock on December 1, 1920. One hundred and forty copies of Water-Supply Paper 374, issued in 1916, and 316 copies of Water-Supply Paper 397, issued in 1916, were on hand December 1, 1920.

Papers in process of publication are the following:

Ground Water in the Meriden Area, Connecticut, by G. A. Waring, Water-Supply Paper 449. This report covers the towns of Meriden, Berlin, Middlefield, Middletown, Cromwell, and Rocky Hill. It includes chapters on the geography and geology of each town, and discusses the water supplies in detail under the headings: water in till, water in stratified drift, water in bed-rock, springs, wells, quality of water. This report has been approved for printing, but has been delayed on account of difficulty in obtaining paper for illustrations.

Ground Water in the Southington-Granby Area, Connecticut, by H. S. Palmer, Water-Supply Paper 466. This report treats of the geography, surface geology, and water resources of the following towns: Cheshire, Prospect, Southington, Wolcott, New Britain, Plainville, Bristol, Plymouth, Farmington, Avon, Burlington, Harwinton, Simsbury, Canton, New Hartford, Granby, Barkhamsted, and Hartland. This report is in page proof.

Ground Water of the Norwalk, Suffield, and Glastonbury Areas, Connecticut, by H. S. Palmer, Water-Supply Paper 470. The towns covered by this report are Suffield, East Granby, Windsor Locks, Enfield, Glastonbury, Marlborough, Norwalk, Darien, New Canaan, Westport, Weston, Wilton, and Ridgefield, which were surveyed in 1916. This report has received approval for printing and is now with the editors.

Waters of the Pomperaug Valley, Connecticut, by A. J. Ellis. This report is based on field work done in 1913 and a series of stream, well, precipitation, and evaporation measurements carried on continuously from May, 1913, to December, 1916, by Ernest W. Parkin, George A. Parkin, and Ralph V. Wooden, under the direction of A. J. Ellis and H. S. Palmer. The data has been largely compiled. Owing to the death of Mr. Ellis, the report will be prepared by some other geologist of the United States Geological Survey.

Ground Water in the New Haven Area, Connecticut, by J. S. Brown. This report has been completed by the author, and will be published as a Water-Supply Paper.

A study of Coastal Ground Water with Special Reference to Connecticut, by J. S. Brown. This report has been completed by the author and will be published as a Water-Supply Paper.

These reports are for general distribution and when published may be obtained free of charge by addressing: Director, United States Geological Survey, Washington, D. C.

The total expense to the State of Connecticut for the six years' (1911-1917) investigation of water resources under the cooperative agreement is $6,000. The Federal Government has expended an equal amount in addition to the cost of supervision and administration and the large expense of publication. To meet the cost of the work done during 1919 and 1920, the United States Geological Survey allotted $1,600 and the State Survey, $1,940.

It is believed that this work, probably the most exhaustive study of a water-supply problem so far undertaken for a large area, has high value. The publications record basal studies whose results will become more useful as the population increases and problems of water rights and of sanitation become more complicated.

Other State Survey Work.

Arrangements have been made with Professor William North Rice for the preparation of a bulletin on the geology and natural history of the Middletown region, a guide-book designed for scientists and teachers. It will probably be completed by the fall of 1921.

The Commissioners accepted in January, 1920, the offer of Professor Alexander Petrunkevitch to prepare a bulletin on the

spiders of Connecticut, a report for which many requests have been made. The completion of this report has been postponed by the author for a year because of unusual demands on his time.

A paper on the Odonata of Connecticut is being prepared by Philip Garman, Assistant Entomologist of the Connecticut Agricultural Experiment Station. This will probably be completed by October, 1921. Mr. Garman is also preparing a paper on Mites of Connecticut.

Arrangements have been made with Leonard M. Tarr, Meteorologist of the United States Weather Bureau, for the preparation of a manual on the climate of Connecticut. This report will take up the location of the State relative to the storm tracks and the character of the storms that pass over this section; the topography and its effect on the weather; the variety of forest and fruit trees and the effect of weather upon them; also the variety of crops that can be raised under favorable conditions; in fact, everything that would be affected by weather changes. It is believed that this report will be completed about April 1, 1921.

Peat Deposits of Connecticut. Under the direction of Professor William North Rice, formerly Superintendent of the Connecticut Survey, an investigation of the peat resources of the State was made from July to October, 1907, and contined during 1908, 1909, and 1914. This work was placed in charge of C. A. Davis, the foremost American authority on occurrence and utilization of peat. All the swamps, both fresh and salt water, of the State were studied and the amount and character of the deposits determined by specially devised sounding apparatus. The field work was supplemented by chemical analyses and microscopic studies and by tests of the value of the product as fuel and as fertilizer. It was pioneer work of high grade, and the methods of study developed have been successfully employed elsewhere. At the time of his death in April, 1916, the completed report had been in the hands of Professor Davis for nearly two years awaiting final revision. A thorough but fruitless search for this manuscript has been made. Fortunately, some of the field notebooks and maps remain, but there is little hope that material for publication can be obtained without practically taking up the work anew.

The proposal of Mr. C. C. Osbon of the American Peat Society to prepare a new report on the peat of Connecticut, a report which will give detailed information regarding the location, magnitude, and uses of the deposits of commercial importance in Hartford and Windham Counties, and including the results of studies already made by him in Fairfield county, has been accepted. This report will be completed by June 1, 1921. It is hoped that funds may be obtained to continue the study of peat deposits of Connecticut until all within the State have been investigated. Dr. E. H. Jenkins, Director of the Agricultural Experiment Station, has offered to assist in carrying on these investigations.

The Superintendent has served as the representative of the State and also of the Federal Government in cooperative work for Connecticut. He has assisted industrial concerns in their search for raw materials and has given advice to individuals and corporations outside of Connecticut in regard to suitable locations for manufacturing plants which plan to make large use of gravel, trap rock, feldspar, clay or peat. He has acted as adviser to various boards and commissions in matters relating to sites for buildings and water supply, and at the request of the Committee on Finance made a study of the water problems confronting the State Institutions at Mansfield and at Storrs. At the request of the Governor, he has served as a member of the committee on selecting a site for the proposed new State Prison.

Plans for Future Work.

I. Geology.

The geology and physical geography of Connecticut possess features of unusual interest. The bulletins already published, the Manual of Geology, the Geological Map, Clays and Clay Industries, Triassic Life, and other reports, have been found useful. It is desirable to continue geologic investigation to include other and more detailed studies of areas and special problems. The State Librarian reports:

> "Bulletin 6, Manual of the Geology of Connecticut, should certainly be reprinted, as it has been out of print some time and is a popular bulletin, perhaps the most popular of those issued."

Among the bulletins which should be prepared are the following:

Connecticut during the Ice Age. An explanatory description of the surface deposits, lakes, waterfalls, eskers, drumlins, and other topographic features for which the glaciers of Pleistocene time are responsible. Requests for the publication of such a report have come from teachers and other citizens.

Igneous and Metamorphic Rocks of Selected Areas. The structure and composition of the rocks of eastern and of western Connecticut are exceedingly complex, but the solution of the problems which they present is very desirable as a contribution to the geologic history of the United States. The studies already made by Professor W. G. Foye should be continued.

Mineralogy of Connecticut. A descriptive list of the minerals of the State, their occurrence, their geologic relations, and economic value.

Physical Geography. A number of papers of moderate size dealing with the geographic factors concerned with the location of cities, of routes of travel, and the development of industries would find a useful place. The reports should be made of type

localities and eventually combined to form a bulletin on the physical geography of the State. The preparation of papers similar to that now being written by Professor Rice (see p. 14) should be undertaken for other areas.

Feldspars of Connecticut. A bulletin describing the location and extent of feldspar deposits and their availability for commercial purposes.

Road-making Materials. A study of rocks of the State with reference to their suitability for use as crushed stone for road construction and concrete.

II. Botany.

The systematic botany of the flowering plants of southern New England has been comparatively well worked out and a list of flowering plants and ferns of Connecticut has been published by the Survey. Of the flowerless plants, the mosses, liverworts, fungi, fresh-water algæ and bacteria have been treated in Survey reports, which have received high commendation. Work on the ecology of the State, and on the peat deposits, is now in progress. Bulletins on the following subjects would be welcomed by students and investigators:

The Marine Algæ of the Connecticut Shore.
The Lichens of Connecticut.
The Trees of Connecticut.

III. Zoology.

Bulletins on the birds of Connecticut, on the fresh-water Protozoa, on the Echinoderms, on the Amphipods and Isopods, and two parts of a Guide to the Insects of Connecticut have been published. Professor Verrill reports that his paper on the Crustacea is nearing completion. It is desirable that in future years bulletins should appear on mammals, fishes, reptiles, Amphibia, and on selected species of marine fauna. Their publication is desirable from both educational and economic viewpoints.

Appropriation Desired.

The work of the Connecticut Geological and Natural History Survey has amply justified its existence; it is highly commended by educational and scientific interests, and by leading business men both within and without the State. By eliminating overhead charges and taking advantage of financial contributions of the Federal Government, an unusual amount of creditable work has been accomplished at an expense far below that which has

been deemed necessary by similar organizations in other states. Although a large sum could be profitably expended on the scientific and educational problems which come within the scope of the Survey, the Commissioners are content to continue this policy of utilizing to the utmost a small but regular biennial appropriation.

They therefore request that the appropriation of $6,000 for the two years just closing be renewed for the years 1921-22.

State of Connecticut

PUBLIC DOCUMENT No. 47

State Geological and Natural History Survey

H. H. ROBINSON, SUPERINTENDENT

BULLETIN NO. 33

HARTFORD
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1925

State Geological and Natural History Survey

Publication approved by the Board of Control.

The Geology of the Stonington Region, Connecticut

By
LAURA HATCH MARTIN, Ph.D.

HARTFORD
Printed by the State Geological and Natural History Survey
1925

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PREFACE

This bulletin presents the results of a detailed study of the geology of the region about Stonington, Connecticut, and in part is based on a manuscript on "The Physical Geography and Geology of the Region around Westerly, Rhode Island", presented at the University of Chicago in partial fulfillment of the requirements for the degree of doctor of philosophy. The field work occupied fourteen weeks during the summers of 1913, 1914 and 1915, and ten weeks in the summer of 1921, with minor revisions in the areal mapping in 1922 as the result of field work on the New London quadrangle which adjoins the Stonington quadrangle on the west. The petrographic study of collected material was done under Professor Albert Johannsen of the University of Chicago and Professor Charles Berkey of Columbia University. The writer wishes to express her grateful acknowledgment to Professors Johannsen and Berkey for much helpful criticism, and also to the late Professor R. D. Salisbury and Dr. R. T. Chamberlin for assistance in connection with the glacial and structural problems.

Geography

The northern part of the area is a region of hills composed either of bare rock, or rock thinly mantled with till. The elevation of the highest hills is slightly over 500 feet. Many of the hills are notably flat topped, regardless of the character of the underlying rock, and appear to be remnants of a former erosion surface of low relief. The general slope of the region is to the south, and the relief, which is from 300 to 400 feet at the north, diminishes gradually until it is not more than 20 to 40 feet near the shore. (See Fig. 2). A strip of country about a mile wide extending eastward along the coast from Watch Hill has the hilly topography of a typical terminal moraine. This moraine is in line with Fishers Island and is a continuation of the inner—Harbor Hill—moraine of Long Island.

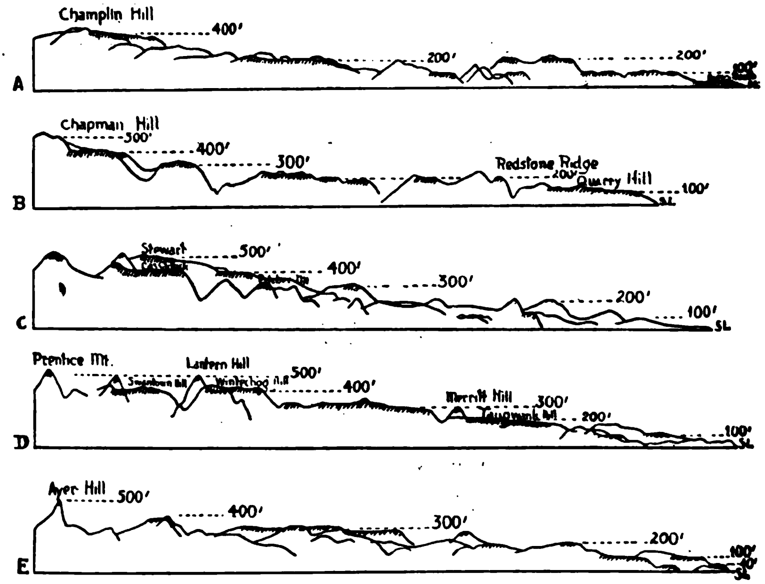

Figure 2. Profiles of hills and divides in the Stonington quadrangle.

The region is drained by a number of streams of which the only important ones are the Pawcatuck and Mystic. The drainage on the whole is poor; swamps are common and salt marshes and ponds fringe the coast and extend for a mile or two inland. Nor-

mally the drainage is to the south, but for that portion behind the terminal moraine the circuitous course of the Pawcatuck offers the only outlet.

The difference in the coastline east and west of the mouth of Pawcatuck River is very striking. West of the river rocky headlands, embayments, and off-shore islands predominate, while to the east, beaches of sand extend almost unbrokenly, behind which are shallow tidal lagoons.

GEOLOGY.

The region is underlain by igneous and metamorphic rocks which comprise: (1) a series of ancient schists; (2) a grano-diorite of variant character, the Stonington gneiss; (3) a series of granitic intrusions known as the Sterling granite gneiss; (4) a series of parallel east-west dikes of granite or quartz-monzonite; (5) veins of aplite, pegmatite, and quartz; (6) dikes of diabase. The rocks in the first three groups, and most of those included in group five, have been usually classed as pre-Cambrian, but recent studies point to a Pennsylvanian age for most of the granites. The unconsolidated deposits consist of till and stratified drift. In spite of the drift cover, however, bedrock outcrops throughout most of the region are plentiful and well suited for study.

PREVIOUS WORK

Previous to this investigation, little detailed work had been done on the geology of the region. Of reports relating to Connecticut, those by Mather[1], Shepard[2], and Percival[3] were published so long ago that they are now mainly of historical interest. More recent reports by Rice and Gregory[4], by Gregory and Robinson[5], and by Barrell and Loughlin[6] contain brief descriptions of the rocks and other geological features. Dale[7] has described in detail the chief

[1] W. W. Mather, Sketch of the geology and mineralogy of New London and Windham counties in Connecticut. 1834. See also, Amer. Jour. Sci., 1st. ser., vol. 23, p. 404, 1833.

[2] C. U. Shepard, A report on the Geological Survey of Connecticut. 1837.

[3] J. C. Percival, Report on the geology of Connecticut. 1842.

[4] W. N. Rice and H. E. Gregory, Manual of the Geology of Connecticut. Conn. Geol. and Nat. Hist. Survey, Bull. 6, 1906.

[5] H. E. Gregory and H. H. Robinson, Preliminary geologic map of Connecticut. Conn. Geol. and Nat. Hist. Survey, Bull. 7, 1907.

[6] J. Barrell and G. F. Loughlin, The lithology of Connecticut. Conn. Geol. and Nat. Hist. Survey, Bull. 13, 1910.

[7] T. N. Dale, The chief granites of Massachusetts, New Hampshire, and Rhode Island. U. S. Geol. Survey, Bull. 354, 1908, and also, with H. E. Gregory, The granites of Connecticut. Bull. 484, 1911.

quarries in the vicinity of Westerly and all points of economic importance concerning the coarse Redstone granite and the fine-grained, or monumental, granites. In 1912, the results of the first detailed mapping of a part of southeastern Connecticut, the Preston region, were published by Loughlin[1], the area studied by him adjoining on the northwest that treated in this report. The work of Davis[2] and of Barrell[3] on the physiographic history of southern New England has a direct bearing on the interpretation of the geology of the Stonington region, and the glacial studies of Fuller[4] furnish a basis for a comparison of the Pleistocene geology with that of Long Island.

The Ancient Schist Series

AREAL DISTRIBUTION

The ancient schist series extends over about one-third of the region, the location of the known parts being shown on the geologic map facing page 12. It probably underlies, also, a large part of the swampy area back of the terminal moraine, as the schist is less resistant than the igneous rocks and lies at lower levels, except where strengthened by numerous granitic sheets. Near the northern border of the schist area granitic injection is very marked in places, as along the upper course of Mystic River, and has much changed the original character of the rock, thus making it difficult to draw an exact boundary. It was particularly difficult to place the boundary where the Sterling granite, normally of reddish color, becomes gray, at the locality two miles north-northwest of Old Mystic. As the scale of the geologic map is not sufficiently large to permit showing these injection zones, it has been necessary to draw the boundary as a single line, located where the schist and granitic injections appeared to be equal in amount.

Small masses of the ancient schists are also found surrounded by granite and grano-diorite. In the Sterling granite they are

[1] G. F. Loughlin, The gabbros and associated rocks at Preston, Connecticut. U. S. Geol. Survey, Bull. 492, 1912.

[2] W. M. Davis, The physical geography of southern New England. Nat. Geog. Soc., Mon. I, pp. 269-304, 1895.

[3] J. Barrell, Piedmont terraces of the northern Appalachians and their mode of origin. Bull. Geol. Soc. Amer. 4th ser., vol. 24, pp. 688-690 (abstract), 1913. Also, The piedmont terraces of the northern Appalachians. Amer. Jour. Sci., 4th ser., vol. 49, pp. 227-258, 327-362, 407-428, 1920. The latter paper was published after Prof. Barrell's death and was edited by H. H. Robinson.

[4] M. L. Fuller, Geology of Fishers Island. Bull. Geol. Soc. Amer., vol. 16, pp. 367-390, 1905. Also, Geology of Long Island. U. S. Geol. Survey, Prof. Paper 82, 1914.

generally inconspicuous, but in the grano-diorite—Stonington gneiss—area it is rare to find any considerable outcrop of the igneous rock which does not include one or more schist masses. Few of these masses, however, are large enough to be shown on the geologic map.

CHARACTER OF THE SERIES

The following members make up the greater part of the series: (1) quartz-biotite schist; (2) quartzite; (3) hornblende and other amphibolite schists; (4) feldspathic schists of probable sedimentary origin.

Quartz-biotite schist constitutes the main body of the series. It occurs in nearly every exposure but in such similar relations, whether above or below another member, that it is impossible to assign definite horizons to the separate beds. It is commonly found alternating with quartzite bands, but in many places quartzite is absent; the amphibolite and feldspathic members also occur in the same interbedded relations.

Quartzite is common within the series, occurring in thin layers. It is always impure, containing biotite in thin flakes, or hornblende, and grades along the strike, as well as across it, into quartz-biotite or amphibolite schist. The quartzite does not occur in the massive form and relative purity that it does farther north and west.

Hornblende schist is abundant and occurs in different associations within the series. The thin layers, interstratified with the quartz-biotite schist and with the impure quartzite, are undoubtedly of sedimentary origin. On the other hand there are hornblende schists which occur in such thick beds of uniform appearance as to suggest an igneous origin.

Feldspathic beds are an important component of the series at some localities. Some of them most probably are recrystallized arkose deposits, but others are highly granitized schists. As already noted, granitization of the schists is a rather common phenomenon in this region, making it difficult to say in many instances, without very detailed study, whether certain rocks should be considered sedimentary or igneous.

The series as a whole is dark colored, but in places alternating thin layers of black hornblendic schists, green schists, and quartzite produce a striking banded effect, and facilitate weathering

of the beds into thin slabs. Very commonly minute crenulations and numerous injections mask the structure of the rocks (Plate 1, a). Where the strata are not intricately folded, however, the bedding planes are generally observable; and even where contortion is pronounced, the bedding is presumably shown by the layers of different minerals, such as the fine bands of variant composition in the green schists, the layers of kinzigite, and other metamorphosed products. In every case the schistosity corresponds with the bedding, even to the minute contortions. The weaker layers have accommodated themselves to the stronger and give the appearance of having flowed in a plastic mass.

These ancient schists of the Stonington region correspond to those which have been mapped elsewhere in southeastern Connecticut as Putnam gneiss and Plainfield quartz schist, and have been traced northward into Massachusetts[1]. These two formations have been studied in detail by Dr. Loughlin in the Preston region which adjoins the Stonington region on the northwest[2].

HISTORY.

The detailed history of the schist series cannot be told because definite horizon markers are lacking and the rocks have been intensely folded and highly metamorphosed. The latter conditions indicate, however, that the sediments were buried under great load and then subjected to mountain making stresses. The period of most intense folding, during which the rocks acquired their schistose structure, occurred before, or perhaps contemporaneously with, the intrusion of the Stonington gneiss—the oldest igneous rock of the region. There was, however, some folding of a later date, for different degrees of contortion in the schists are associated with the successive igneous injections (Plate V, b). All these deformations must have occurred when the rocks were in the zone of flow.

A second period of dynamic action took place after prolonged erosion had greatly reduced the overlying load of sediments and brought those remaining into the zone of fracture. At this time faulting and jointing of the rocks occurred. Some of the displace-

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[1] W. N. Rice and H. E. Gregory, Manual of the Geology of Connecticut. Conn. Geol. and Nat. Hist. Survey, Bull. 6, pp. 129-134, 1906.

[2] G. F. Loughlin, The gabbros and associated rocks at Preston, Connecticut. U. S. Geol. Survey, Bull. 492, p. 16, 1912.

ment zones were later filled with granite or pegmatite and these rocks have also been slightly faulted, thus indicating that there was another, though minor, period of dynamic action.

PETROGRAPHY OF THE SCHIST SERIES.

The more common varieties of the schists, as they occur in the adjacent Preston region, have been already described[1], and only those will be treated here which throw additional light on the origin of the series. In particular, the relations of the thin quartzite layers to the interbedded gray, green, and black schists have been little studied. They are valuable, however, as determining the sedimentary origin of otherwise doubtful beds.

Interbedded quartzite and green schist.

At several localities in the region, quartzite in layers an inch or two in thickness grades into, and is also interbedded with, a green schist. In some instances, fine layers of biotite schist and kinzigite are also present. This relationship is best seen one-half mile west of Ashaway, where the beds are extremely contorted. Megascopically, the green layers consist of a white granular mass with well-orientated flakes of a light green ferro-magnesian mineral and a little biotite.

Under the microscope, the faintly greenish color of the rock is seen to be due to the presence of actinolite crystals, which have a subparallel arrangement. The rock contains about 25 per cent. of this mineral, and, in addition, xenomorphic granular diopside (35 per cent.), quartz (20 per cent.), small grains of andesine filled with sausserite (10 per cent.), and microcline (8 per cent.). Titanite and zircon are accessories, and calcite is the chief secondary product. The field relations and peculiar composition of this rock, with calcium, magnesium, and low alumina, indicate the recrystallization of an impure limestone.

Interbedded quartzite and quartz-biotite schist

This rock is strikingly banded, the black and white layers ranging from one-sixteenth to one-half inch in thickness. Some of the black bands are pure biotite, others pure hornblende, and still

[1] G. F. Loughlin, loc. cit., pp. 16-21.

others contain more or less quartz with both biotite and hornblende. Where the quartzite bands are associated primarily with quartz-biotite schist bands, the rock has the following microscopic character. The quartzite layer, which is typical of the embedded quartzite layers of the series, has a groundmass of xenomorphic quartz and andesine grains, averaging 1 mm. in diameter, in which very small well orientated biotite laths and a few apatite grains are embedded. Some of the dark layers consist chiefly of large biotite crystals, contain more feldspar than quartz, and include many accessory and secondary minerals. The chief minerals in the biotite schist are quartz, andesine, biotite, and hornblende; as accessories are zoisite, epidote, monazite, titanite and zircon. Secondary mica is more highly developed in the plagioclase of the biotitic bands. Some bands have a higher percentage of hornblende, and the rock may pass abruptly into a typical hornblende schist. The schist shows the effects of strain since its recrystallization.

The interbedding of biotite schist with quartzite undoubtedly indicates sedimentary origin, but in the present recrystallized product there is no indication of the original grains of the sediment. The biotite schist probably represents original clayey layers with a high calcium content. The iron and magnesium of the biotite, however, may be due to included basic sediment or to the addition of such elements to calcareous layers from adjacent igneous rocks, as seems to be the case for some of the amphibolite schists. Some of the accessory minerals (monazite and zircon) may have been inherited from igneous rocks from which the sedimentary material was derived.

Interbedded quartzite and hornblende schist.

The interbedding of quartzite with the hornblende schist is most interesting. At some localities the layers of these two rocks are remarkably distinct; at others they clearly grade into each other. The alternating beds for the most part are one-half to one inch thick, although some are less than one-sixteenth inch.

Under the microscope the quartzite shows xenomorphic granular quartz (75 per cent.), andesine intergrown with the quartz and including some minute crystals of titanite, biotite, and apatite (15 per cent.), hornblende (7 per cent.), and biotite (3 per cent.).

The larger grains of quartz and feldspar are generally elongated in the same direction as the biotite and hornblende crystals. Some andesine crystals are almost completely altered to white mica and the biotite is partly chloritized.

The hornblende schist interbedded with the quartzite consists of the same minerals but in very different proportions. Quartz is practically absent (only about two per cent.), whereas hornblende comprises 53 per cent., and andesine 45 per cent., of the rock. Titanite and magnetite are important accessories.

Hornblende schist

The hornblende schist described in this section occurs in thick massive layers or lenses in the schist series, with no relation to the quartzite. The uniform grain throughout any one exposure is particularly noticeable, although at some localities it is coarse, having a dioritic effect, whereas at others, it is fine or almost aphanitic.

Under the microscope the rock is found to be mainly hornblende (60 per cent.), and andesine or labradorite (30 per cent.). The feldspar is commonly untwinned. The schistosity is apparent in the general parallel orientation of the hornblende. Biotite is present in very small quantity. Magnetite and hematite form about six per cent. of the rock, the former in great abundance and generally surrounded by titanite. The usual small apatite and zircon grains are present. Quartz is never present except in small amount, and is generally absent. The character, composition, and field relations of many of the massive hornblende schist layers associated with the quartz-biotite schist, and of some thin layers associated with quartzite, suggest that the original material was basaltic tuff and without doubt was deposited in water. The origin of the extensive hornblende schist formation of the Preston region was similarly explained by Loughlin[1].

It seems probable, however, that other masses of hornblende schist represent original calcareous and dolomitic material. The nearest recognizable deposits of such material are found in North Stonington, and Loughlin describes a specimen from the contact of dolomite and hornblende schist in which bands rich in tremolite alternate with those rich in green hornblende. The actinolite, tremolite, and epidote patches and layers occasionally found in the

[1] Loc. cit., pp. 19 and 66-67.

schists of the Stonington region probably indicate the former presence of lenses of impure limestone.

Adams and Barlow[1] concluded that the amphibolites in the Haliburton and Bancroft areas in Canada were derived from limestones because they found transition members between unaltered limestone at a distance from the batholiths of that region and amphibolites, without calcite, near them. Their general conclusion was that "under intense metamorphism a number of rock types, very different in origin and character, yield a convergent type of alteration products which belong to the class of amphibolites and which resemble one another so closely that they are in many cases indistinguishable."

Greater metamorphism in the Westerly region than farther north in Connecticut and east in Rhode Island, where limestones have been reported, may account not only for the lack of calcareous layers but also for the lack of phyllites and slates, and instead the development of gray biotite schists and feldspathic gneisses.

There are other masses of hornblende schist of coarse grain and cross-cutting relations, as well as a few injections in the feldspathic gneisses retaining parallel walls, which are undoubtedly igneous intrusions. Locally this massive type is indistinguishable from the Stonington gneiss, a gneissoid quartz-diorite in the southwestern part of the region which is clearly igneous and later than the quartzite and sedimentary hornblende schists.

Meta-conglomerate

The quartz-biotite schist contains a thin layer of meta-conglomerate, one mile west of Ashaway. The latter is additional proof, therefore, of the sedimentary origin of the schist, and is important for correlation purposes.

The matrix of the meta-conglomerate is grayish in color and similar to the schist in composition. The pebbles are represented by elongate patches of white very schistose material, averaging three-fourths of an inch in length, one-fourth of an inch in width, and one-sixteenth of an inch in thickness.

The difference between the pebble and the matrix is very apparent under the microscope. The pebble shows a decidedly

[1] F. D. Adams and A. E. Barlow. Geology of the Haliburton and Bancroft Areas, Ontario. Geol. Survey of Canada, Dept. of Mines, Memoir 6, 1910.

schistose structure and consists of quartz (80 per cent.), and sillimanite (19 per cent.), with garnet, muscovite and an apatite forming the remaining 1 per cent. The sillimanite fibers (Plate II, a.) are developed chiefly between elongated six-sided quartz grains. The matrix, on the other hand, shows a general rough orientation of biotite crystals (about 15 per cent.), without notable elongation of the associated quartz. Oligoclase-andesine occurs in small amount (five per cent.), and sillimanite is absent. The accessory minerals are much the same as in the pebbles. The matrix shows the effects of strain. The composition of the matrix seems to indicate an original sandy mud, whereas the pebbles were derived from an argillaceous sandstone free from iron and the alkaline bases.

Meta-conglomerates from Wordens Pond and Watsons Pier, R. I.

For the purpose of determining the extent of the schist series in neighboring regions, and also of determining the age of the schists in the Stonington region, the meta-conglomerates at Wordens Pond, R. I., six miles east of Westerly, and at Watsons Pier, on Narragansett Bay, were studied.

In the hand specimen the rock from Wordens Pond closely resembles the meta-conglomerate which occurs at Ashaway. The pebbles have the same appearance, but in general are somewhat larger, and the matrix is the same biotite schist. Under the microscope the rock is seen to be practically identical in texture and mineral composition with the Ashaway meta-conglomerate. The pebbles are the same sillimanite schist and the matrix is the same biotite schist, except that the oligoclase-andesine is present in somewhat greater amount (10 per cent.) (Plate II, b.). It may be said, therefore, that the meta-conglomerate of the Stonington region extends as far east as Wordens Pond, or but six miles from the west side of Narragansett Bay.

At Watsons Pier on the west shore of Narragansett Bay, the Kingston series of Pennsylvanian age is exposed and has a very schistose character. In places this series develops a phase which somewhat resembles the Ashaway and Wordens Pond meta-conglomerates in general size of grain and in having small white patches which were formerly pebbles. The matrix is a biotite schist but has a peculiar bluish sheen, due to muscovite, which was not observed in the conglomerates from the other localities.

The microscopic structure, however, is very different from the two meta-conglomerates described above, and there is no sharp division between the pebbles and the matrix. The pebbles consist of pure quartz, which is strained, cracked, and intergrown around the edges with the quartz of the matrix. The pebbles vary in size from 1 cm. to about 1 mm. The larger ones are decidedly elongated, and in thin section show only a broad belt of cracked quartz, but the smaller ones keep their oval form and are not always completely orientated (see Q, Plate III, a.). The matrix consists of albite (about 60 per cent.), quartz (35 per cent.), biotite (four per cent.), and muscovite (one per cent.). Apatite in quite large grains and colorless garnet are also present in very small amount. Magnetite dust is present and gives rise to a part of the limonite stain, which is also due to the alteration of biotite. Zircon gives pleochroic halos in biotite.

This rock is apparently a recrystallized sediment consisting of quartz pebbles embedded in an arkosic matrix. The zircon was derived from some older igneous rock, whereas the large apatite crystals may show recrystallized phosphatic material of organic origin.

The rock at Watsons Pier thus differs radically from the meta-conglomerates at Ashaway and Wordens Pond. No sillimanite schist is present, the pebbles having come from quartz veins or pure quartzite rock. The matrix is not only finer grained and has an entirely different appearance, but is composed largely of albite, whereas the western conglomerates contain only small amounts of oligoclase-andesine.

AGE RELATIONS.

The sedimentary rocks of the Stonington region are so highly metamorphosed that no fossils remain. The only method of ascertaining their age is to trace them, or their associated igneous rocks, into regions where rocks of known age occur. The nearest area is the Narragansett Basin, where Carboniferous rocks are unconformable on a complex of ancient schists, rare Cambrian sediments, and intrusives, except on the southwest, where an irruptive contact occurs. Metamorphism has affected some of the Narragansett sediments, and the metamorphism increases in intensity

toward the southwest[1], the area with which this study is particularly concerned.

The ancient sedimentary series of the Stonington region outcrops in discontinuous bands or isolated masses in the granite, and cannot therefore be traced continuously to the Narragansett Basin. Large swamps and a heavy drift cover add to the difficulty.

It is possible, however, to trace the igneous rocks of the region into an area where sedimentary rocks of known age occur. G. F. Loughlin[2] has found that the Sterling batholith extends from the Stonington region to the southwest border of the Narragansett Basin, where it invades the Kingston series of Mid-Pennsylvanian age. He concludes that the ancient schists of the Preston region (which are continuous with those of the Stonington region) are the more highly metamorphosed equivalent of that series, and hence are Mid-Pennsylvanian in age.

The writer agrees with Dr. Loughlin that the schist series of Connecticut extends in the same relations to the granite as far east as Wordens Pond, the most convincing evidence being the exact similarity between the meta-conglomerate at Wordens Pond and that at Ashaway. (See Plate II, a, and b.). It appears more reasonable, however, to correlate this series with the ancient Blackstone series which is found in patches along the western border of the Narragansett Basin, and is overlain unconformably by the Kingston sediments.

It seems unlikely that sediments of Mid-Pennsylvanian age could have been laid down in the Stonington region, deeply buried, and subjected to strong folding and igneous injection before the main granite intrusion of the region occurred in late Pennsylvanian time. Although there is as great metamorphism in part of the Kingston sediments as in the schists in Connecticut, yet its origin is not so complex and can be attributed either to the heat and water of the intruding granite or to the contemporaneous diastrophic effects. Successive foldings preceding the Sterling granite, with igneous injections of variant composition,

[1] F. H. Lahee, Relations of the degree of metamorphism to geological structure and to acid intrusions in the Narragansett Basin, R. I. Amer. Jour. Sci., 4th ser., vol. 33, pp. 366-367, 1912.

[2] Intrusive granites and associated metamorphic sediments in southwestern Rhode Island. Amer. Jour. Sci., 4th ser., vol. 29, pp. 447-457, 1910. Also, with L. A. Hechlinger, An unconformity in the Narragansett Basin of Rhode Island and Massachusetts. Ditto, 4th ser., vol. 38, pp. 45-64, 1914.

are unknown in the Narragansett region so far as the writer has been able to ascertain.

The main reasons, therefore, for believing that the ancient schists of the Stonington region are not of the same age as the Kingston sediments, are: (1) the difference in general character of the two series, and (2) the likeness of the schists in the Stonington region to those of the ancient Blackstone series which form part of the complex on which the Kingston sediments were deposited.

The Kingston series, where not highly metamorphosed, consists of normal sedimentary rocks, predominantly impure sandstones and shales with some conglomerate in which the pebbles are quartzite. Carbonaceous matter is abundant, whereas limestone and basic matter, which could be recrystallized into hornblende schists, is practically absent. The Kingston series, although cut by sheets of the Sterling granite (Plate I, b.) around its southwestern border and by some basic igneous rocks in the northwest part of the basin, is not intimately associated with them, and is entirely free from them at a short distance from the border. The sedimentary character of the strata is clearly shown, even in the most highly metamorphosed beds, by the difference in composition and grain of the material and the gradation to phyllites, slates, and graphitic beds.

The Blackstone series, with which it is proposed to correlate the schists of the Stonington region, has been described by J. B. Woodworth [1], B. K. Emerson and J. H. Perry[2], and more recently by C. H. Warren and Sydney Powers[3]. It is an ancient schist series dominantly sedimentary, consisting of quartzites, quartz-schists, phyllites, green schists and amphibolites, and thick beds of crystalline limestones with soapstone and serpentine. The series is cut by granite, and large areas of schist have thus been isolated, such as the quartzite area near Natick, Rhode Island. There were also earlier igneous intrusions some of which were basic.

Similarities between the Blackstone series and the schist series of the Stonington region are striking.

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[1] (With N. S. Shaler and A. F. Foerste), The geology of the Narragansett Basin. U. S. Geol. Survey, Mon. 33, pp. 104-109, 1899.

[2] The green schists and associated granites and porphyries of Rhode Island. U. S. Geol. Survey, Bull. 311, p. 10, 1907.

[3] Geology of the Diamond Hill, Cumberland district in Rhode Island and Massachusetts. Bull. Geol. Soc. Amer., Vol. 25, p. 440, 1914.

Quartzites occur in both but are much thicker in the Blackstone series. They are gray, brownish, or yellowish in color, due to minute included biotite flakes. The quartzites of both series grade into quartz-biotite schists and hornblende schists, but the Blackstone in addition has talc and serpentine intra-beds which seem to be lacking in the schists of the Stonington region. Similar green schists and amphibolites are common to the two series.

Both schist series have similar intimate relations to early igneous rocks; some of the latter cannot be separated easily from the sedimentary members of the series.

Both series show the effects of very intense dynamic action, with perhaps more faulting than folding in the Blackstone series as compared with the schists of the Stonington region, a difference which may be due to the greater extent and massiveness of the quartzites.

The distribution of the Blackstone series in "elongate patches which are enclosed in a great granite batholith on all sides up to the point where they are in contact with the Carboniferous"[1] is strikingly like the distribution of the schists in the Stonington region.

Most of the patches of the Blackstone series are mapped as occurring in Milford granite (of doubtful age), but one large area of schists south of Pascoag, R. I., called Marlboro and Westboro formations, is known to be enclosed in Sterling granite[2]. It seems more reasonable to the writer to correlate the isolated patches in the same batholith with one another than with the sediments of a well defined basin of the Narragansett type. Furthermore, Emerson has mapped the Plainfield quartz schist in northeastern Connecticut with the Westboro ("Grafton") quartzite, and the Putnam gneiss adjacent to that formation on the west. If, therefore, a more detailed study of the Plainfield quartz schist and Putnam gneiss should show that their distribution is as given on the preliminary geologic map of Connecticut[3], then the correctness of the proposed correlation of the ancient schists of the Stonington region with the Blackstone series would seem assured.

The exact age of the Blackstone series is not known. It is undoubtedly pre-Pennsylvanian because the Kingston series, at

[1] B. K. Emerson and J. H. Perry, loc. cit., p. 11.
[2] B. K. Emerson, Geology of Massachusetts and Rhode Island. U. S. Geol. Survey, Bull. 597, p. 26, 1917.
[3] Conn. Geol. and Nat. Hist. Survey, Bull. 7, 1907.

several localities along the western side of the Narragansett Basin, contains pebbles derived from the Blackstone beds and from the granite which intrudes them[1]. Emerson and Perry placed the Blackstone series in the Cambrian, because it seemed to have been derived from rocks similar to the Attleboro and Braintree Cambrian rocks. Loughlin also accepts the Cambrian age for the series. Most workers in this field, however, have placed the series in the pre-Cambrian[2].

The Igneous Rocks.

The igneous rocks of the Stonington region are: (1) the Stonington gneiss, a gray grano-diorite of variant composition not before recognized as a separate formation; (2) the Sterling granite gneiss group, which includes several closely related rocks generally light pink to red in color; (3) blue and gray granite and quartz monzonite in dikes, known as the Westerly monumental granites; (4) aplites, pegmatites, and igneous quartz of several ages; (5) diabase in small dikes. The Preston gabbro, which is shown on the geologic map, has been described by Dr. G. F. Loughlin[3], and hence is not treated in this report. The areal distribution of the foregoing groups of rocks is shown on the geologic map (facing page 12). Because of the intricate association of the different rocks, it is rare to find areas of any size where only a single type occurs. It should be kept in mind that subordinate amounts of other igneous rocks, and of schists, may be present in addition to the one indicated.

The Stonington Gneiss.

The Stonington gneiss is the oldest igneous rock of the region because it is cut by all the others. It extends along the coast from the vicinity of Pawcatuck River westward to the border of the region. It is well exposed in a roughly circular area the center of which is about two and one-half miles northeast of Stonington. Within this area, injections of later granites are scarce, but there

[1] B. K. Emerson and J. H. Perry, loc. cit., p. 88. G. F. Loughlin, loc. cit., Amer. Jour. Sci., 4th ser., vol. 38, p. 51, 1914.
[2] W. O. Crosby, Contributions to the geology of eastern Massachusetts, Boston. Soc. Nat. Hist., Occas. Papers, No. 3, 1880. N. S. Shaler, On the geology of the Cambrian district of Bristol County, Mass. Harvard College, Mus. Comp. Zool., Bull., vol. 16, p. 15, 1888. J. B. Woodworth, loc. cit., p. 105. C. H. Warren and Sydney Powers, loc. cit, p. 445. B. K. Emerson, loc. cit., p. 26.
[3] U. S. Geol. Survey, Bull. 492, 1912.

are numerous included masses of schist. Both east of the Pawcatuck and west of Stonington, however, the rock becomes much cut up and otherwise affected by later intrusions. The rock of these portions will be spoken of as the "Stonington mixture" and is indicated on the geologic map by an over-pattern placed on that of the Stonington gneiss. In the Stonington mixture one can generally see that the schists were disrupted first by the Stonington gneiss, the numerous schist blocks showing all stages of assimilation. Later the early phases of the Sterling granite intrusions in some places evidently softened the gneiss, so that the two rocks became thoroughly interleaved or mixed in a marble cake fashion. The succeeding injections of the Sterling, and still later granites, show an increasing definiteness of contact with the gneiss. Thus exposures of the Stonington mixture give an impression of disorder as compared with the distinctly banded injection gneiss to be described later.

Even within the roughly circular area of few injections, the Stonington gneiss shows a high degree of variability. The most striking variety is a very coarse quartz-diorite composed of andesine, hornblende, mica, and a very little quartz, showing flow structure and very little evidence of strain. This grades into a black and white gneiss, an oligoclase-granite, in which hornblende may or may not be present with the black biotite, and evidence of great strain is apparent. In places this variety becomes slightly pinkish in color, but this is rare, and the rock as a whole presents a gray, or black and white appearance. It is possible that many of the abrupt variations in composition are due to assimilation of the schists.

On the east the Pawcatuck marks the general boundary of the massive development of the gneiss. But the Stonington mixture extends a little farther east as shown by boulders and the few exposures under the till on Quarry Hill south of Westerly. In the southeastern part of the region outcrops are buried to large extent under glacial drift and swamps.

On the north and for a short distance on the southeast, the rock injects the schists parallel to their bedding and, becoming more and more compressed, is indistinguishable from the hornblende-plagioclase schists. This border zone is about one-half mile wide and is mapped as injection gneiss. The rock has a decidedly banded ap-

pearance, consisting as it does of black schists alternating with gray gneisses, and in places is cut by red granite or pegmatite sheets. This banded rock is in the same general alignment as the neighboring schists but differs notably from the much disturbed part of the Stonington gneiss (Stonington mixture), although both may show the same component members and may grade abruptly into each other along their contact.

PETROGRAPHY

The Stonington gneiss has a highly variable character but may be divided into its most typical phases: (1) quartz-diorite, (2) black and white oligoclase-granite, (3) pinkish phases intermediate in character between the above varieties and the Sterling injections.

Quartz-diorite

Megascopic characters. The quartz-diorite is a coarse-grained black and white rock with a strong flow structure. It consists chiefly of grayish-white plagioclase and hornblende. A little quartz is present and small amounts of biotite, magnetite, pyrite, and probably allanite.

Microscopic characters. The rock is coarse-grained and has a xenomorphic, inequigranular texture. Andesine crystals, three to four mm. in diameter, make up about 60 per cent. of the rock, while deep green hornblende (15 per cent.), quartz (13 per cent.), and biotite (five per cent.) are next in importance. Orthoclase (five per cent.) and accessories, chiefly magnetite, make up the remainder of the rock. The andesine is in well twinned crystals in places enclosed by large irregular hornblende grains. Magnetite forms grains two mm. in diameter. It is generally surrounded by titanite, and in places surrounds oval grains of monazite, an interesting mineral already reported from the Westerly region by Dr. Kemp[1]. Zircon, apatite, and pyrite complete the list of accessory minerals. Allanite may be present, unless stains similar to those produced by it can be attributed to the monazite (Plate III, b.).

The rock is very little altered, and the plagioclase is especially fresh as compared with that of the members of the Sterling series.

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[1] J. F. Kemp, Granites of southern Rhode Island and Connecticut, with observations on Atlantic Coast granites in general. Bull. Geol. Soc. Amer., vol. 10, p. 368, 1899.

Although a little kaolin and white mica is developed along some twinning bands, many large crystals of andesine may be found practically water-clear. Some of the biotite shows considerable alteration to chlorite and hematite.

There is little evidence of strain in the rock as a whole. The contacts between crystals are clear cut and there was evidently no movement after crystallization.

Within the quartz-diorite are found dark masses which seem to be clearly inclusions, yet are practically identical with the surrounding rock in composition, only more basic. In these the amount of andesine drops to 50 per cent., whereas the dark constituents increase. The iron ores make up about five per cent. of the rock and show an interesting interstitial character (Plate IV, a.).

There are also masses probably originally inclusions which show no traces of their original form or structure. These are the garnetiferous segregations, elongated in the direction of flowage, which are found in both the quartz-diorite (Plate V, a.) and the oligoclase-granite. The minerals have a somewhat concentric arrangement in places, the heavy hornblende and much of the plagioclase occupying the central portion, and the garnet with some epidote and andesine forming an outer zone in which there are occasional little threads of pyrite. From the composition of the minerals such segregations seem to be the result of the assimilation of lime-magnesian rocks by the hot magma.

Origin. The microscopic examination of the quartz-diorite and its included schist fragments upholds the hypothesis that the great variability of the rock is due to a large extent to the assimilation of many schist fragments, the whole association of rocks and inclusions showing a near roof condition.

The black and white oligoclase-granite

Megascopic characters. This phase is found over the greater part of the Stonington gneiss area and is especially well developed about a mile north of Stonington. The rock is medium to coarse grained, the mineral constituents being oriented in decided flow lines. Its general effect is a black and white gneiss which is much coarser than the other rocks of the region.

Microscopic characters. The rock is xenomorphic granular, the grains averaging about 1.2 mm. in diameter. It is composed of oligoclase (about 45 per cent.), quartz (30 per cent.), microline and orthoclase (20 per cent.), biotite (four per cent.), and accessories (one per cent.). The accessories include titaniferous magnetite, some grains of which are surrounded by titanite rims, apatite, zircon, and either allanite or monazite in very small deep yellow grains causing a pleochroic halo in the biotite. Probably both are present.

In its lack of alteration it looks like the quartz-diorite phase already described. This type, however, shows more internal change due to pressure than any other non-recrystallized rock in the region.

Origin. The oligoclase-granite shows no special internal evidence of a complex history. Evidence of strain shows that it is one of the oldest rocks of the region. This is an important point, for the quartz-diorite into which it grades does not show this feature.

Pinkish intermediate phases

Under this head are grouped many parts of the Stonington gneiss which in general resemble the Sterling granite gneiss. Some of them (for example Pawcatuck Rocks, two miles south of Westerly,) are like the black and white oligoclase-granite just mentioned, only slightly red in color; others are clearly the result of injection of a later pinkish magma (alaskite or Redstone granite) into the gray or black and white Stonington gneiss. The pink Stonington gneiss as a rule is coarser than the normal granite gneiss and contains less biotite, which is less well distributed and orientated than in the latter. Hornblende is present with, or replaces, the biotite, and the rock has a fresh appearance contrasting with the great clouding of the feldspar which is characteristic of the Sterling granite gneiss. From a reddish weathered surface, however, it is often difficult to be certain whether Stonington gneiss or Sterling granite gneiss is present.

SUMMARY

The gradational contacts between the three types of Stonington gneiss show that they were probably all parts of the same magma. The quartz-diorite, being more locally developed than

the other phases, and more closely associated with inclusions, is probably a special phase which originally had the oligoclase-granite composition. The oligoclase-granite is not very different from the Sterling granite except in color, while the local pinkish phases closely resemble the latter on a weathered surface.

The Problem of the Stonington Gneiss

The Stonington gneiss is undoubtedly younger than the schists as it contains numerous inclusions of them and intrudes them along its northern and southeastern border. In the injection gneiss on the south side of Hinkley Hill, sheets of quartz-diorite occur which are quite gneissic in appearance and yet show the speckled appearance and microscopic characters of the Stonington gneiss. Traced farther north the quartz-diorite becomes less and less easily recognized, and either ceases or is indistinguishable from the coarse hornblende schists.

The more basic character of the Stonington gneiss as a whole, compared to the members of the Sterling granite series and its own occasional very basic character, suggests that it may be the upper part of an early local intrusion, similar to the gabbro laccolith of Preston, Conn., in which a lower more basic phase is covered, or that it may be an early igneous rock of considerable extent in neighboring regions, but represented here only in small quantity.

Various facts bear upon these hypotheses. Two features indicate that the Stonington gneiss may be an early local intrusion: (1) Its composition (quartz-diorite and oligoclase-granite), which is similar to the upper part of the Preston gabbro laccolith, and (2) the apparent curving of the structure lines at the contact with surrounding schists, a feature well shown by the attitude of the Redstone granite at the east end of Redstone Ridge. This suggests that by its intrusion the adjacent schists were oriented parallel with the periphery of the mass, whereas later granites coming from below were diverted to the border in much the same way as around the Preston gabbro ten miles farther north.[1]

But the Stonington gneiss lacks the well defined boundary of the Preston laccolith, and the more basic part, a quartz-diorite, seems to have no determinable relation to the oligoclase-granite,

[1] G. F. Loughlin, U. S. Geol. Survey, Bull. 492, p. 32.

which here is in too great amount to be a local variation. Most of the Redstone granite is east and north of the Stonington gneiss, yet there are dikes of it, and also of alaskite, even in the heart of the area, so the gneiss did not divert the granite as a whole. The number of schist fragments included within the magma, as well as the alignment of the strikes and the verticality of the dips in those believed to be roof-pendants, show that the method of intrusion was probably by stoping rather than by the bending upward of overlying material. The fact that the quartz-diorite shows so little strain, and that so many of the schist fragments are angular, also disproves any suggestion that it might have been a sill or laccolith which was later so pressed that the schists of the roof were down-folded into the igneous rock, thus destroying the laccolithic form.

The change in the direction of the strike of the schists and granite sheets east of Westerly may have more to do with the Preston gabbro to the north than with the Stonington gneiss area. The prevailing strike of the schists and gneisses outside of the Stonington region is north-south[1], and it has been assumed by workers in the neighboring areas[2] that the general orogenic forces during the period in which the Sterling granite was injected, operated in a general east-west direction.

If the resistance set up by the Preston gabbro and added to by the force of the diverted granite sheets were sufficient to affect the schists five to ten miles from the border, then we would expect the east-west strikes parallel with the southern part of the gabro mass as seen in the belt along the Stonington gneiss border. The gradual weakening toward the east of the secondary forces set up by the gabbro until the structure of the rocks becomes controlled by the major east-west stress would account for the change in direction of the strike along the whole eastern border of the map. This seems to be corroborated on the New London map, for southwest of the gabbro mass the strikes again change to a north-south direction. Thus the Stonington gneiss is probably not a separate local intrusion similar to that of the Preston gabbro, nor does it seem to be related to the latter in any way.

It is probably more closely related to other igneous rocks noted

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[1] Conn. Geol. and Nat. His. Survey, Bull. 7, Map.

[2] G. F. Loughlin, U. S. Geol. Survey, Bull. 492, pp. 30-32.. Also, Amer. Jour. Sci. vol. 38, p. 57. A. C. Hawkins, Reconnaissance Map of R. I.

in adjacent parts of southern Connecticut. A similar gray variable gneiss has been described as part of the Mamacoke gneiss, and also as occurring near New London, Conn.[1]

The Stonington gneiss, at least the highly injected phase, continues along the coast as far west as New London[2] and can probably be proved to be the same as the gray gneisses mentioned.

THE STERLING GRANITE GNEISS.

Sterling granite gneiss is the name given to a series of granite intrusions, many in the form of sheets, which cut all the older rocks of southeastern Connecticut and southwestern Rhode Island.

The Sterling granite has been called a gneiss, a term appropriate for most of the Sterling phases if a gneiss is a banded rock in which feldspar is important. If, however, a distinction is made between a gneissic and a gneissoid rock, meaning by the first, one in which a secondary structure has been developed by dynamic pressure, then the Sterling granites in the Stonington region are not true gneisses. They are gneissoid, or "flow granites", the orientation and banding of the constitutents being a primary and not a secondary structure. The group name must necessarily be used rather loosely because one of the phases of the Sterling (Redstone granite) generally has no banding. Moreover, part of the series elsewhere seems to develop a true gneissic structure.[3] Because of the great extent and general relations of the Sterling granite gneiss to older rocks, it is suggested that it is really a great batholitic mass, the roof of which has been removed in part only. As mapped by Loughlin[4], the Sterling granite has a considerable development in the area which immediately adjoins the Stonington region on the north. It is also well developed in the region under discussion where it forms the northern boundary of the schist belt. It also breaks through the schists in numerous localities, the most notable exposure being found at the Redstone Ridge (Carrs Mountain) just north of Westerly. The Sterling granite also probably underlies the Stonington gneiss, for numerous dikes of its easily

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[1] Manual of Geology of Connecticut. Conn. Geol. and Nat. Hist. Survey, Bull. 6, pp. 149 and 150, 1906.
[2] L. H. Martin, unpublished geologic map of New London quadrangle, east of Thames River.
[3] U. S. Geol. Surv., Bull. 492, p. 120-126, 1912.
[4] G. F. Loughlin, U. S. Geol. Surv., Bull. 492, Plate II, 1912.

recognizable phases (alaskite and Redstone), as well as red pegmatite, occur in most parts of the gray gneiss area.

The Sterling granite gneiss may be separated for convenience of description into three main varieties based on slight textural and compositional differences which by their structural relations show slightly different periods of intrusion. These are (1) granite gneiss, (2) alaskite, (3) Redstone granite.

The Granite Gneiss.

The granite gneiss (similar to the "normal granite gneiss" described by Loughlin) is the phase of greatest development in the Stonington region. It is generally a pinkish or pinkish gray, fine-grained rock, and has a strongly developed primary orientation of the biotite crystals. On a fresh surface this feature is not very noticeable, but is brought out on weathered surfaces by depressions along the lines of the weaker minerals. It is somewhat variable in composition and grain and in places becomes lighter colored by the lessening of biotite content, so that there is difficulty in separating it from the alaskite. At some localities a greater development of pink feldspar crystals, which are arranged in wavy flow lines, suggests a porphyritic texture. The porphyritic, or augen, gneiss of the Preston region to the north is not recognized, however, within the Stonington region. The nearest approach to this rock is a coarse-grained granite, with a tendency to porphyritic development, found at Bradford, R. I., (just beyond the eastern border of the area) and for a mile southward.

The granite gneiss of this region is really a flow granite, although there is evidence of considerable strain in the undulatory extinction and cracking of the quartz and the occasional bending of the biotites, but the stresses were not sufficient to cause a true granulation or secondary orientation. The fact that the same rock, at least the porphyritic variety, farther north does show true gneissic structure, may mean that the period of injection was one of great dynamic action, as postulated by Loughlin, but that the pressure was either greater toward the north or that the rock intruded there solidified earlier. The granite farther south might still have remained plastic and would have had to conform to the different stresses by flowage and so bring about the strong flow lines developed in that section. Where the granite gneiss solidi-

fied before later material was injected, we have the predominance of the plagioclase feldspars as in the typical variety which has a composition of oligoclase (40 per cent.), quartz (30 per cent.), microcline (25 per cent.), and biotite (5 per cent.), but where injected by later granites a more acid, more inequigranular variety is found.

ALASKITE.

Alaskite, similar to that in the Preston region[1], occurs in the northern part of the area. It is light pink or tan in color, medium grained, and with a tendency to develop a gneissoid structure through the parallel orientation of the longer axes of the quartz and feldspar grains. It breaks through the schist in sheets and disrupting masses, as seen in the numerous exposures along Mystic River. It is also seen at the mouth of that river, and elsewhere, cutting the Stonington gneiss.

The intimate association of the alaskite with the material it injects is better seen in the Stonington gneiss area than elsewhere because of the contrasting colors of the rocks. In places there is a *lit-par-lit* injection on a small scale, each layer having the characteristic of the parent rock and yet grading into the other along the contact. A pseudoporphyritic variety is developed where the alaskite advanced along the flow lines of the gneiss or included schist and where the acid magma seems to have thoroughly permeated the older rock.

Alaskite injects the Sterling granite gneiss in the same way it does the Stonington gneiss. Within the parts mapped as alaskite and granite gneiss there is generally an interleaving of the two, and the geologic map simply shows the rock that is present in greatest abundance. In places the sheets seem to be quite thick and massive, but in practically every exposure some interleaved material can be found. In all cases the alaskite seems to have been injected during differentiation, for rocks transitional in composition between alaskite and the older Sterling granite gneiss can be found. Where typically developed, the rock is composed of about 53 per cent. microcline (and a little orthoclase), quartz (25 per cent.), albite (20 per cent.), biotite and muscovite (1 per cent.), ilmenite, and a little zircon. (Plate IV, b.)

[1] Loughlin, loc. cit., p. 128.

In the Stonington gneiss area the alaskite in places is pinker, and is interesting because here monazite occurs in large enough grains to be satisfactorily studied. The monzonite is associated with magnetite, but is in a group of crystals surrounding a few grains of the iron. The crystals are about 0.2 of a millimeter in diameter and are oval or rounded in outline. The aggregate covers an area one millimeter in length. Beautiful positive biaxial figures can be procured on basal sections, thus distinguishing it from xenotime. The latter gives a negative figure and was also found in a Westerly gray granite by Dr. Kemp.[1]

The Redstone Granite.

The main varieties of the Sterling granite have been described from neighboring regions, and the essential differences in their development in the Stonington area, already noted in this report. But Redstone granite has not before been separated as a distinct phase. This will therefore be discussed in detail.

The Redstone granite is the last distinct phase of the Sterling series. It resembles the granite gneiss in composition and was classed with it by Dr. Loughlin.[2] He notes that the "normal" granite gneiss shows less strain effect than the "porphyritic" granite gneiss farther north and states: "These characters are evidence that metamorphism diminished in amount to the southward. This rock at Westerly, R. I., three miles south of the area, is quarried under the name of Westerly Red granite."

The reasons for separating the Redstone (Westerly Red) granite from the normal granite gneiss are:

(1) The granite gneiss retains its characteristic gneissic appearance throughout its extent in the Stonington region. The whole type may be less gneissic than corresponding rocks in the northern part of the Preston area, but it does not grade into the non-gneissic Redstone as suggested by Loughlin.

(2) The Redstone granite is found not only in the Stonington region but cutting the Sterling granite gneiss at numerous places within the area mapped by Dr. Loughlin. However, the

[1] James F. Kemp. Intrusive granites of Rhode Island and Connecticut: Bull. Geol. Soc. Am., Vol. 10, pp. 368-9, 1899. Dr. Kemp found both monazite and xenotime in Westerly granites, and notes the fact brought out by Merrill in 1885 (Tenth Census, Vol. X, p. 20) that the Westerly granites in general are rich in accessory minerals.
[2] Loc. cit., p. 126.

abundant pegmatite, accompanying the Redstone granite, makes many contacts appear blurred.

(3) The Redstone granite has a typical granitic texture where developed in quantity, whereas the granite gneiss is a typical flow gneiss. The Redstone has been affected as much by dynamic action since its crystallization as the granite gneiss, and it also shows the same amount of strain in all parts of the region.

AREAL DISTRIBUTION

The Redstone granite is typically developed as thin sheets and small irregularly shaped intrusions throughout the granite gneiss areas, and where it breaks through the schists it is generally in sheets parallel with the structure. At Redstone Ridge, the red granite broadens from a few feet in thickness on the west to a mass half a mile wide near Westerly. From this point the granite continues east for two miles parallel with the schists, and then, with them, makes a sharp turn to the south. South of Burden (Chapman) Pond, the granite loses its sheet form but appears again farther east in a boss-like mass. Just what are the relations of the Redstone granite to the schists or other neighboring rock along the eastern border of the region cannot be told on account of the heavy drift and swamp deposits.

The Redstone granite cuts the Stonington gneiss as it does the Sterling granite gneiss to the north, and the boundaries are more clearly seen in the south because of the contrasting colors of the two rocks. The more general distribution of this Redstone variety, its coarse granitoid texture, and its broad boss-like development in the southeast corner of the region suggest that this granite may be the main batholitic material which underlies the region as a whole.

PETROGRAPHY

Megascopic characters. In its typical appearance the Redstone granite is a coarse-grained rock of medium red to greenish red color and much more massive than the other varieties of Sterling granite. The larger pink feldspar grains reach one-fourth to three-eighths inch in diameter, whereas the other grains average half that size. The rock consists of pink microcline, white to greenish plagioclase, quartz and biotite. Magnetite and pyrite are seen in most hand specimens, and rarely some rust producing crys-

tal, probably allanite. When in small quantities the granite is somewhat inequigranular. In places the rock grades into a biotite-pegmatite.

Microscopic characters. Where typically developed, as at a number of places on Redstone Ridge, the rock has a xenomorphic granular texture. In large dikes and sheets the estimated composition is: microline and orthoclase (40 per cent.), oligoclase with oligoclase-albite rims (35 per cent.), quartz (20 per cent.), biotite (4 per cent.), and accessories (1 per cent.), while in smaller dikes and thin sheets the potash feldspars are greatly in excess, in places comprising 60 per cent. of the rock. The interior of the zonal plagioclase crystals is clouded with kaolin and sericite whereas the outer rim is clear, giving a clouded effect similar to that of the feldspar in the granite gneiss and in contrast to the clear plagioclase of the Stonington gneiss. The accessory minerals are more numerous but of the same kind as in the other Sterling phases. Secondary muscovite, in large irregular flakes, is associated with the feldspars, and is developed irregularly between minerals or fills cracks even in quartz grains.

Variations. The Redstone granite retains its typical character in almost every part of the region except where it grades into pegmatite or in the thinnest sheets where the biotite flakes are somewhat oriented. The only notable variation is that found at the west end of Morrisons Ridge, where the broad sheets of Redstone pinches out two miles north of Wequetequock. Here a coarse pinkish gray or white granite is found in which the quartz is in long parallel pencils or lenses. This variety can be traced eastward directly into the typical Redstone granite. The Redstone granite contains a few partly assimilated fragments of schists and the same biotitic knots and schlieren noted in the other varieties. Chlorite is developed along sheet jointing in a zone in the Redstone quarry. Near the joints the plagioclase feldspars also have become chloritized and the granite is unfit for use. Such zones are probably due to the shearing and pneumatolitic action accompanying the intrusion of diabase.

REDSTONE GRANITE IN NEIGHBORING REGIONS.

Samples of rock were taken at Narragansett Pier and at two miles west of Saunderstown, R. I., in the area mapped by Emer-

son and Perry as Northbridge gneiss, but considered by the writer as part of the Sterling batholith. The rock exposed at Narragansett Pier is indistinguishable from the Redstone both megascopically and microscopically, except that in places it is more pegmatitic and carries more muscovite. The "Northbridge gneiss" west of Saunderstown differs from the Redstone in some ways; but it is probably a border phase of the Sterling batholith. Its pencils of quartz resemble the local phase of Redstone on Morrisons Ridge (see above). It has a more acid composition, higher muscovite content, and greater strain conditions which can probably be explained by its closer contact with the sediments of the Narragansett Basin. Although it does not resemble the Redstone as closely as that at Narragansett Pier, it is probably the same thing, as more muscovitic phases of the latter were found north and west of Narragansett Pier grading into the "Northbridge gneiss".

The Westerly Monumental Granites.

Fine-grained granites and quartz-monzonites cut the older igneous and metamorphic rocks as east-west dikes, which range in width from a few inches to 150 feet. In the broader ones quarrying has been carried on for a century and a half, and Westerly has become famous for its fine monumental stone.

Outcrops of this granite are most numerous in a zone two to three miles broad which passes almost due east and west through the town of Westerly, and includes all the commercial quarries from Mystic, Conn., to Bradford, R. I. One dike may be traced for a mile or more on the surface through the string of quarries at Bradford. The strike of the intrusions is somewhat irregular; in places the granite of the same dike appears to be separated by blocks of the country rock, or to wedge out completely. For these reasons it is impossible to predict whether good stone will be found along the strike as followed from the quarry.

The Westerly monumental granites are an entirely different series of intrusions from the Sterling granites, and can be easily distinguished from them by a finer grain, more massive structure, greater resistance to weathering, and by contact phenomena, such as the development of long biotite and radiating allanite crystals. They are prevailingly east-west dikes with dips of 30 to 45 degrees to the south regardless of the changes in the strike and

dip of the schists and of the Sterling granite sheets. They cut across the schist series and the interleaved igneous rocks in the way shown at the quarry on Talbot Hill, three-fourths of a mile northeast of Westerly (Fig. 3). Practically identical conditions exist at the other quarries, although in few places are both contacts so well exposed.

The magma seems to have risen along a series of southward dipping planes, breaking off fragments of the wall rock which

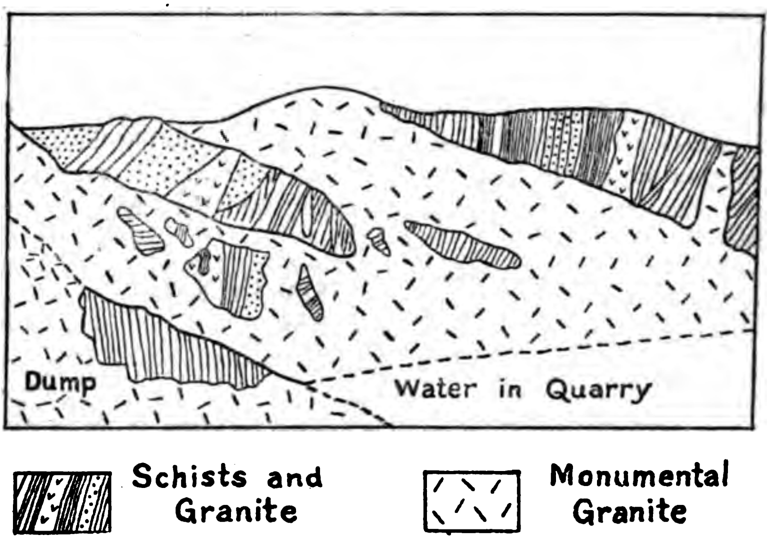

FIGURE 3. Dike of Westerly monumental granite intruding injection gneiss on Talbot Hill.

sank into the dike material and were in part assimilated. A few fragments are "frozen" in, showing that the process of shattering the wall rock continued until the magma became too viscous for the blocks to sink. Most blocks, however, are located near the foot wall of the dikes, and quarry-men will cut down until blocks begin to appear in the floor of the quarry, after which they follow down the dip along the upper contact to get better stone.

Across the strike of the dikes, at intervals of a few hundred feet, the stone becomes weak, discolored, and unfit for commercial purposes, and strips 10 to 30 feet wide are left as head walls between quarries. It was suggested by Dale[1] that these zones repre-

[1] U. S. Geol. Survey, Bull. 354, p. 198, 1908.

sent transverse dikes of different material, because one at the Smith deep quarry seemed to contain oligoclase-andesine feldspar instead of the oligoclase to oligoclase-albite of the adjacent blue granite. This difference, however, does not seem important as the feldspars are so kaolinized and sericitized that they are very difficult of precise determination. There is no real line of demarcation between the good granite and the discolored, incoherent granite of the head wall. The transverse joints merely become more numerous, curved and intersecting, and the alteration of the granite becomes correspondingly greater. The joints are probably due to strain set up on cooling, groups of planes relieving the tension at fairly regular intervals. These then acted as avenues of escape for gases which altered the adjacent granite by pneumatolitic action, as is shown by the great amount of epidote, chlorite, sericite and hematite along the joint surfaces. That the head walls were originally the same material as the rest of the dike is shown by the presence of cores of unaltered blue granite in the center of the larger joint blocks. The deep pink color on the face of some of the vertical joints in other parts of the quarries is probably due to a similar deep-seated change which, however, did not go so far as to weaken the granite.

The monumental granites (quartz-monzonites and granodiorites) have been described by Dale[1]. They may be divided into three types based on color. The blue (or gray) granite is in greatest abundance and makes up the bulk of the larger dikes, while pink or "swamp" granite is developed locally in the blue and in many of the smaller dikes, particularly those on the Redstone ridge. A third variety has a variable composition, pink or white color, and a greater length of biotite than the others. It is a contact phase in part at least. The relation of the granites to each other is an interesting petrographic problem.

WESTERLY BLUE (GRANODIORITE).

Westerly "blue" is a medium grained massive rock of blue to gray color, consisting of light greenish blue plagioclase feldspars, quartz, and biotite. Occasional grains of magnetite, titanite and a mineral producing brown stains may be seen in most hand specimens. The composition averages: oligoclase to oligoclase-albite

[1] Loc. cit.; also Bull. 484, 1911.

(45 per cent.), quartz (25 per cent.), microcline and orthoclase (22 per cent.), biotite (6 per cent.), accessories (2 per cent.) which include titanite in large crystals, magnetite, zircon, allanite (some twinned crystals), muscovite and apatite. This type is therefore a granodiorite.

The Westerly blue granodiorite is probably the original magma which intruded the older rocks, for it is in all of the larger dikes and is very uniform in appearance and composition throughout the region. Few strain effects are seen, showing that it was intruded after the reduction of the main stresses which affected the Sterling series.

WESTERLY PINK OR "SWAMP" GRANITE.

This rock is massive, very fine grained, pinkish-gray or buff in color, and highly esteemed for fine carving. It is like the "blue" in structure, but is more altered internally, the most striking difference being the greater clouding of the feldspar with pink kaolin, which apparently gives the color to the rock.

The composition of the rock is about the same as that of the blue granite. At the Pinkstone quarry a much more acid variety, quartz-monzonite, occurs, the composition of which is: quartz (40 per cent.), microcline (30 per cent.), oligoclase to oligoclase-albite (26 per cent.), biotite (2 per cent.). The accessories (2 per cent.) are magnetite, pyrite, zircon, apatite, allanite and augite (the latter in small isolated grains).

The difference in the color is probably due to some deep-seated change. At the Smith deep quarry, the place where the "blue" can be found grading into the pink or "swamp" granite, the sheets in the "swamp" are much thinner than elsewhere, and the vertical joints are also nearer together. Along these joints, also, the granite is a much deeper pink color, which suggests that whatever the change was, it was more intense along joint planes.

Contact phases. The monumental granites are generally associated with a pink or white phase in which the biotite crystals attain a size five and ten times that of the other grains. In most places the biotite is not in excessive amount but is conspicuous because needle like grains (in places three-eighths inch in length) are developed and roughly oriented into flow lines. This variety is conspicuous also in many places because the groups of radiating

allanite crystals have disappeared, leaving greenish brown stains in the rock.

This variety is the only one exposed in many places, as in the narrow dikes which intrude the injection gneiss on Talbot and Hinkley hills. It may be found along the upper contact of pink or blue granite dikes as at the Catto quarry where it is locally three feet thick.

A white or buff-colored variety with brown stains is found below the blue granite, at the Smith deep quarry at Westerly, and at Morrisons quarry two miles north of Wequetequock. Here the white granite is mixed with the blue in a marble cake fashion where the two come together, but the white also spreads up into the blue along vertical planes. The white is in considerable quantity in places, and is taken as a sign of the giving out of the blue granite in depth.

MINOR INJECTIONS.

Pegmatite and igneous quartz are associated with each of the periods of igneous intrusion but have small areal extent. The early pegmatites are mostly white or gray, whereas the later ones are uniformly pink. Aplite, of a deep pink color, is found cutting the monumental granite in narrow dikes, as at the Calder and Carnie quarry on the Redstone ridge, and is probably an end phase of the monumental granite stage of injection.

DIABASE DIKES.

Two narrow dikes of diabase cut the Redstone and the monumental granites at the Redstone quarry near Westerly.[1] They followed vertical undulating planes. The diabase is black in color and has well developed phenocrysts of olivine from one-sixteenth to one-twelfth inch in diameter. One dike is cracked parallel with its strike and filled with fibrous calcite or satinspar. There are also dark colored veins parallel with the dikes which cut the granite, and were probably made by hot emanations from below at a time immediately following the injection of the dike material.

Dale refers this diabase tentatively to the Triassic period to correspond with other Triassic dikes of neighboring regions. If

[1] T. Nelson Dale, U. S. Geol. Survey, Bull. 354, p. 231.

this may be assumed, a younger time limit is set for the granite intrusions, as these dikes cut the latest of the Sterling granite phases and the subsequent monumental granite as well.

Age of the Igneous Rocks.

Dr. Loughlin was the first to trace the Sterling granite from the Westerly region to the Narragansett Basin.

At the contact with the sediments the granite is generally the porphyritic gneissoid variety, and it is associated with the Redstone granite which not only cuts it but invades the adjacent sediments.

On Tower Hill near Wakefield, R I., Redstone granite carrying much muscovite is found injecting the sediments in irregular sheets. (Plate I, b). Along the shore near Watsons Pier, great white muscovite-bearing pegmatite dikes, possibly the equivalent of the Redstone granite, cut the highly inclined sedimentary rocks. These may be contemporaneous, however, with the still later intrusion of the monumental quartz-monzonite, for the latter is found cutting the Sterling granite near Wakefield and at Narragansett Pier in the same manner as in the Stonington region.

On all the contacts examined by the writer, Redstone granite and pegmatite were the only varieties of the Sterling series actually found cutting the sediments, but, as in every case they were also associated closely with the porphyritic gneissoid variety not far from the contact, it can be taken for granted that the batholith as a whole followed the laying down of the sediments.[1]

The Redstone granite shows as much internal strain as the other Sterling varieties but no flow structure. Therefore if the flow structure was induced by pressure during intrusion, the Redstone granite must have come in after the granite gneiss had flowed and become partially solidified, but before the pressure on the region ceased. It is probably practically contemporaneous with the alaskite in the west, and grades into some of the pegmatites, at least, in the Narragansett Basin.

[1] The relation of the time of intrusion to the internal structure of the rock has been worked out petrographically by Dr. Loughlin for he Preston, Conn., region. (Loc. cit., pp. 127-133), and by Dr. Lahee for the Narragansett Basin (Loc. cit., p. 466). Both agree that the gneissoid structure was probably due to intrusion under stress, while the alaskite and the pegmatites were intruded when movement had practically ceased.

The sedimentary rocks in this portion of the Narragansett Basin are highly crystalline, but have been traced northward and found to be equivalent to the Coal Measures of Mid-Pennsylvanian age.[1] Thus the Redstone granite, at least, is post-middle Pennsylvanian. As the orogenic movement which folded the Kingston sediments is probably the same as that in which the granite gneiss was intruded, a post-Kingston age for the whole batholith, as assumed by Dr. Loughlin, seems reasonable. Dr. Loughlin[2] has also found that the Sterling batholith is pre-Dighton in age. He finds pebbles of both the porphyritic gneissoid (granite gneiss), and muscovitic (Redstone) varieties, as well as of the Kingston sediments, in the Dighton conglomerate in the northern part of the Basin. This calls for a great unconformity in the middle of the Narragansett series, or between the Kingston sediments which are Mid-Pennsylvanian, and the Dighton conglomerate which is Permian[3] in age.

Thus all the petrographic evidence of dynamic pressure for the different stages of the Sterling granite must be related to the orogenic movement in late Pennsylvanian time rather than to that at the close of the Permian. The earlier movement was by far the greater, although the folding of the Dighton conglomerate "was sufficient to develop steeply dipping folds and intense compression effects; it" (from evidence in the Narragansett Basin) "was not accompanied by igneous intrusion."[4] This second orogenic stage could not have extended much beyond the sides of the basins of sedimentation or the latter phases of the Sterling granite would show other effects than the slight strain in the quartz.

Dr. Loughlin concludes that the prevailing stress during the earlier movement was east-west, producing the general north-south folds seen over most of Rhode Island and Connecticut, while the later stress was at right angles to this and produced the east-west folds in the Narragansett Basin. This conclusion can be substantiated only partially in the Stonington region. The

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[1] Foerste, U. S. Geol. Surv., Mono. 33, p. 134.

[2] G. F. Loughlin and L. A. Hechinger, An unconformity in the Narragansett Basin of Rhode Island and Massachusetts. Am. Jour. Sci., Vol. 38, p. 53, 1914.

[3] The probable Permian age of the conglomerate was first suggested by Woodward, Mono., 33, p. 184-7, but has been proved on structural grounds by Loughlin in Am. Jour. Sci., Vol. 38, p. 54, who also cites obscure fossil evidence found by David White, 1914.

[4] G. F. Loughlin, Loc. cit., Am. Jour. Sci., Vol. 38, p. 57.

Sterling granite follows east-west strikes in the greater part of the area and changes to north-south lines only on the eastern side of the region. The reason for this may be the resistance set up by the Preston gabbro to the northwest which offset locally the tendency to north-south folding noted in neighboring regions.

There was, however, a period of distinct north-south stress later than the Sterling invasion as is shown by the system of parallel east-west dikes of monumental granite. At the time of the last orogenic movement at the close of the Permian the strain may have been relieved in the Stonington region by great southward dipping east-west faults or shear zones, which were then invaded by the monumental rock. If the pressure was thus relieved along certain definite lines, it may account for the lack of strain seen in the younger members of the Sterling group to the south as contrasted with the varieties farther north. It would also disprove Dr. Loughlin's assertion that the post-Permian orogenic movement was not accompanied by igneous intrusions.

The diabase dikes are probably of Triassic age.

Summary.

The time relations of the igneous rocks and their associated sedimentaries to other rocks and the periods of stress are believed to be as follows:

	Stonington Region	Correlation
Triassic	Associated veins Dikes of diabase	Diabase of Connecticut Valley.
	(Dikes of monumental granite	Narragansett Basin North-south stress Folding of Dighton conglomerate
Permian		Dighton conglomerate
Late-Pennsylvanian	(Sterling Batholith: Pegmatites and quartz Redstone Alaskite Granite gneiss	Diminishing stress East-west stress locally offset in Stonington region
Middle-Pennsylvanian		Kingston sediments
Pre-Pennsylvanian	(Stonington gneiss)	
Pre-Cambrian	(Ancient schist series)	Putnam gneiss, Plainfield quartz schist of Connecticut Blackstone series of Rhode Island and Massachusetts.

PHYSIOGRAPHY

In mapping the geology of the Stonington region, the writer has been interested in testing the contrasting hypotheses used in interpreting the accordance of summit levels in southern New England. The problem is particularly important for the physiographer because it concerns the origin of an extensive older erosion surface, the so-called Cretaceous peneplain,—whether that surface was developed as the result of subaerial or marine erosion.

TOPOGRAPHY OF THE REGION

The topography of the Stonington region consists of two strongly contrasting types. One of these is the narrow belt of rough land which extends eastward along the coast from Watch Hill, R. I., and also westward on Fishers Island. This area is practically devoid of rock outcrops and its knob-like hills, irregular ridges, and undrained depressions mark the position of a well-developed terminal moraine. North of the morainal belt the hills consist chiefly of bedrock, more or less covered with till, and increase in height toward the northwest. Many of the hills are isolated, but in some localities they merge for five or six miles to form an almost continuous upland between drainage lines. Many of the individual hills are a mile or more in their longer dimension, are broad, and all have noticeably flat tops (Fig. 2).

At a distance the sky line, formed by the coalescing outlines of many hills, is remarkably even. On closer examination, however, it is seen that the upland level is not an unbroken slope toward the sea, nor is it a rolling topography suggestive of subaerial erosion alone, but that the parts really constitute a series of broad low steps or terraces.

To restore a general picture of this upland surface a system of projected profiles was used. For this purpose the region was divided into strips, averaging about two and one-half miles in width, and paralleling the major valleys. Profiles of the divides between the north-south valleys, and of the tops of the hills within the same strip, were projected on the same plane. The results are shown in Fig. 2. It will be seen that there is considerable level land and an accordance of hill tops at elevations which correspond over the whole area.

The elevations of the several terraces, or benches, shown on the profiles, are as follows:

1.	80-120 feet,	which may be called the 100-foot level.
2.	200-240 feet,	" " " " " 200-foot level.
3.	280-320 feet,	" " " " " 300-foot level.
4.	380-420 feet,	" " " " " 400-foot level.
5.	480-520 feet,	" " " " " 500-foot level.

There is another possible terrace at 40-60 feet above sea level which is fairly well shown around Stonington but elsewhere is so modified by glacial deposits that it will be disregarded.

An analysis of these profiles, combined with a study of the field itself, leads the writer to believe that these levels were produced, most probably, by wave action. The flatness of the upland patches at different elevations, combined with the development of corresponding levels on the several interfluvial ridges, shows the work of a common erosive agent. That each level abuts against distinctly higher hills and that the line separating any two levels roughly parallels the present shore, and not the river valleys, seems to indicate that wave erosion was the most important agency in the formation of the benches. When it is also found that these levels correspond over wide areas, and that it is thus possible to draw approximate shore lines to show the extent of these former sea advances, the hypothesis of origin by wave erosion takes on an increased probability (Fig. 4).

The vertical distance between terraces (about 100 feet) is so small, and the scarps are now so gentle, that the unaided eye generally cannot differentiate the various levels in the field at distances of a mile or more. At the southern end of Wintechog Hill, for instance, the upland narrows and drops to the 300-foot level within a quarter of a mile. A view taken from the top of Pitcher Mountain, two and one-half miles east of this point, shows this drop in the middle of the sky line (Plate VI, a.). It will be noted that the 300-foot level, which is seen at the left, is not readily distinguished from the 400-foot level of Wintechog Hill on the right. The difference is brought out, however, and the scarp between the two levels readily located, by holding a straight edge parallel with the horizon line in the left part of the view.

RELATION OF THE TERRACES TO THE GEOLOGY

There would be little value in a study of this kind unless the hypothesis can be eliminated that such terraces may be due to dif-

ferences in rock structures or hardness. Fortunately the geology has been worked out so that this hypothesis may be tested.

The best profile, showing all the terraces, is undoubtedly that of the long divide extending south from Barnes Hill through Swantown and Wintechog Hills to the shore. The line may be continued northward to Bay Mountain in Voluntown. The geol-

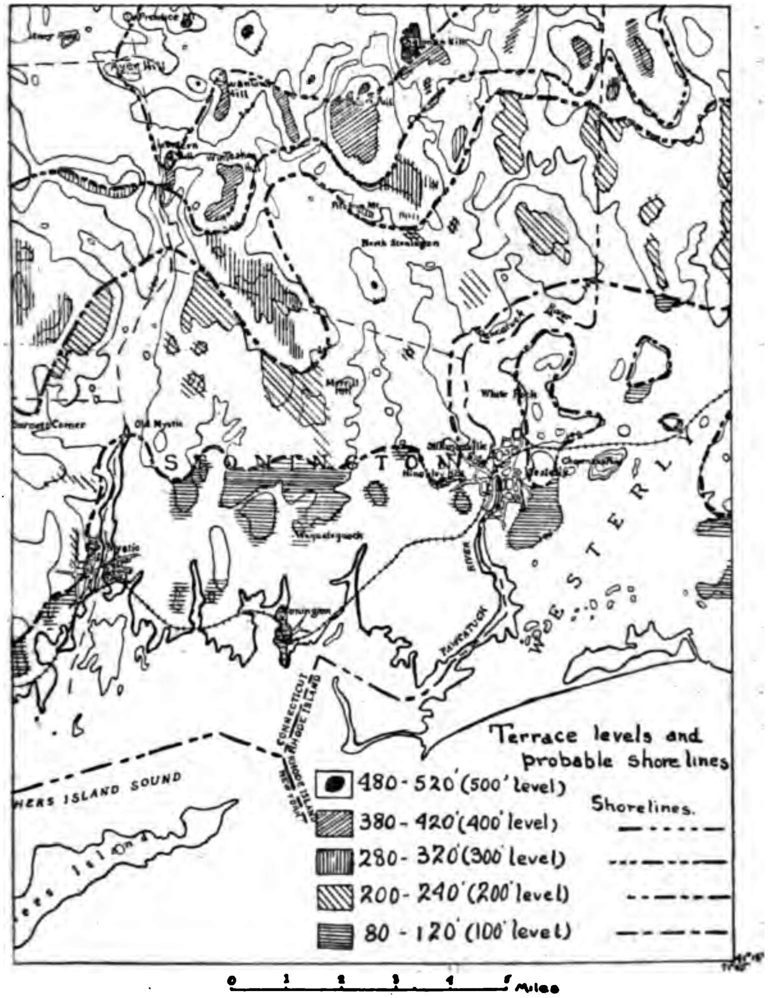

FIGURE 4. Map of Stonington quadrangle showing terrace levels and probable ancient shore lines. Contour interval, 100 feet.

ogy along this line is shown in Fig. 5. Four distinct levels are seen which show no relation whatever to the rock structure. The 300-foot level is distinctly shown in Fig 2, E, and Fig. 5, covering a considerable area, and there is probably no error in considering it a separate terrace.

The best terraces are found on the hard rock, but are not due to differences in hardness, for the same rock, such as alaskite or granite gneiss, shows terraces at different elevations.

The most resistant rock of the region is the quartz mass of Lantern Hill, and here one might expect evidence of wave erosion at more than one level, if the hypothesis of successive periods of

Fig. 8.

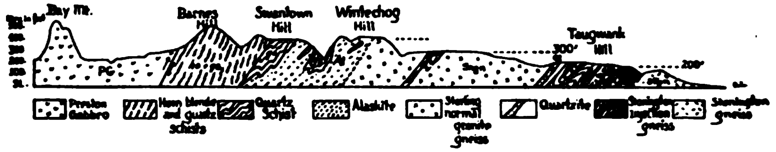

FIGURE 5. Geology along divide extending south from Wintechog Hill (Line B-B, Geologic Map, p. 12), and continued north to Bay Mountain (Moosup Quadrangle). Geology by Dr. G. F. Loughlin, U. S. Geol. Surv., Bull. 492, 1912, and by the writer.

wave erosion is correct. Such evidence appears to be present, for the profile of the hill shows the 400-foot level well developed over the middle portion (Long Hill), and there is a perceptible notch on the southern side at about the 300-foot level. At the northern end, also, a portion of the hill still reaches the 500-foot elevation. This higher knob at the northern end strongly suggests that marine, rather than subaerial, erosion cut the 400-foot level above which it rises.

POSSIBLE ERRORS IN INTERPRETING THE TOPOGRAPHY

Glacial modification.

Continental ice modified the pre-glacial surface somewhat by scraping it and depositing drift in places. The rock hills were little changed, however, as they are not *rôche moutonnée* forms, but still retain their flat tops. Many show small knobs on their northern ends (Swantown, Cassadock, and Wintechog Hills, as well as Lantern Hill), which may be explained as remnants pro-

jecting above wave-cut surfaces, for it would seem that such knobs should be the first to disappear under strong glacial carving. Because the region has been covered to a greater or less depth with glacial drift, it is not possible to picture the exact preglacial surface, nor is it known whether marine deposits are present or absent on these terraces. It is possible that such deposits may be present but have not yet been differentiated from the abundant glacial deposits of the region.

Possible inaccuracies of the map

Errors in the determination of the different levels might exist because of inaccuracies of the map. In this region, however, the tops of the hills were accessible at the time the surveys were made, and their elevations were presumably determined with approximate accuracy. The early roads, far from shunning the hill tops, were either the shortest routes between points, as the Providence-New London turnpike, or were laid out on the broad upland areas to avoid, as far as possible, the swampy or sandy lowlands in the valleys. The very flat, relatively good farm land on these hills led to their early clearing.

Nature of surface on which terraces were made

Up to the time of Prof. Barrell's masterly presentation of the hypothesis of marine planation in relation to the piedmont region of the Northern Appalachians[1], the idea held sway that two main subaerial erosion periods were accountable for the principal physiographic features of the eastern United States. The greater erosion surface, commonly called the "Cretaceous peneplain", was supposed to have been a continuation of the erosion surface on which the Cretaceous sediments are found in the Coastal Plain, and to have extended over most of the present Appalachian and New England regions. The flat topped hills and approximately accordant summit levels throughout the eastern United States have been supposed to be remnants of this old erosion surface. The Cretaceous plain was then supposed to have been uplifted, tilted and domed, and the areas of softer beds reduced to a second peneplain of lower level in Tertiary times. In the Stonington region

[1] Originally presented at New Haven in 1912. Abstracts in Bull. Geol. Soc. Amer., vol. 24, pp. 688-696, 1913, and recently published posthumously and edited by H. H. Robinson, in Amer. Jour. Sci., 4th ser., vol. xlix, pp. 227-258, 327-362, 407-428, 1920.

all traces of two such erosion surfaces, if they ever existed, have been obliterated.

It is impractical to conceive of an erosion surface that would include all the broad flat tops of the hills at the various levels when their relation to the geology is taken into account. Such a surface would have to be warped along the very sinuous shore lines, and along each line would have to be warped exactly the same amount over the whole area. There would have to be four distinct vertical down-folds if the broad areas at the 500-foot, 400-foot, 300-foot, 200-foot and 100-foot levels are considered parts of it. If they are, then why should Lantern and Ayer Hills and Prentice Mountain, which rise from broad areas at the 400-foot level, all reach to the elevation of the broad upland patches farther north? Nor can any one level for the peneplain be worked out, for then the accordance of levels above and below it must be accounted for. Partial baselevels are seen along the river valleys, but they are as difficult to reduce to any one erosion surface as the tops of the hills.

The only clue to the position of the Cretaceous peneplain within this region is found in a well-boring on Fishers Island.[1] Bedrock is found 280 feet below sea level and is overlain by clay similar to the Cretaceous material on Long Island. If this depth may be taken as the position of the peneplain three miles from the Connecticut shore, the slope becomes 90 feet per mile. This slope continued across the Stonington quadrangle would rise far above the present surface. The peneplain might, of course, be warped to correspond to the tops of the higher hills, but if so, it would change from a slope of 90 feet per mile to one of 14 feet per mile within a distance of eight miles from the coast. It could not, however, be made to include the best flat areas without the complex warping mentioned above. In any case, the peneplain surface is practically unrecognizable in the region, the topography having been entirely recarved by subsequent erosion.

Although there is no distinct evidence of the Cretaceous peneplain, there is a suggestion that the region was at one time reduced to a surface of little or no relief, and covered with coastal plain material. This is apparent from the superposition of some of the

[1] M. L. Fuller, Geology of Fishers Island, N. Y., Bull. Geol. Soc. Amer., vol. xvi, pp. 367-390, 1905.

streams on very hard rock; the Shunock-Pawcatuck River, for example, probably would not have crossed Redstone Ridge at Westerly unless let down upon it.

The superposition of the lower Connecticut, and the southeast courses of other rivers in southern New England, dates undoubtedly from a period when an erosion surface was mantled with enough marine material so that on uplift the rivers flowed to the southeast regardless of the underlying structure. This southeast course of the rivers is shown best in the Connecticut and Housatonic, and also in some of the upper tributaries of the Thames. But the lower course of the Thames, and practically all the smaller rivers in the shoreward part of Connecticut, show a decidedly north-south arrangement, as in the Stonington region. This seems to call for another advance of the sea at a later date, with a coating of marine sediments to obliterate the southeast trending valleys near the sea. After this advance the land rose uniformly, causing many of the streams to take a southerly, as contrasted with their former southeasterly, course to the sea. The change from a southeasterly to a southerly course is most clearly shown in the lower Housatonic, and it is to be noted that the higher hills reach the 500-foot level near the locality where the course of the river changes in direction.

It is thus believed that there was an incursion of the sea which developed the terraces at the 500-foot level, and that the topography of the Stonington quadrangle dates only from that incursion, whatever its date.

Whether the 500-foot level was a peneplain of subaerial erosion which was covered by marine sediments as the sea advanced, or whether it was carved out primarily by the sea, cannot be told. The writer believes that at least its final form was due to wave erosion, because of its similarity to the terraces at lower elevations which so strongly suggest a marine origin. The lower terraces were probably carved out of what remained of this 500-foot plain after extensive subaerial erosion had taken place.. The subparallel bending inward of the shorelines along river valleys, shows that at no later date, however, did the sea obliterate all marks of the previous river erosion.

While wave planation was going on along the shore, subaerial forces were doing much to remove the higher land in the interior.

Thus the extensive lower surfaces along the Quinebaug were probably developed while the waves were attacking the very resistant rocks farther south. The difference in the amount of flat upland north and south of the group of high hills in North Stonington and Voluntown is significant of the difference in the two erosional processes.

Indistinct benches, 50-60 feet above the terrace levels, can be seen in many of the river valleys to the north and in the upper levels of the smaller hills. These probably show the temporary baselevels established in the river valleys corresponding to the different sea levels shown by the terraces in the Stonington region.

Glacial Geology

INTRODUCTION

That the Stonington region was glaciated during Wisconsin time is abundantly proved by the topography, the drainage systems, and the character of the unconsolidated deposits. All the unconsolidated formations, except the recent swamp and beach deposits, were laid down by the continental ice sheet and its attendant subglacial or extraglacial waters. The distribution of these deposits in the eastern part of the region, which is typical for the region as a whole, is shown in Fig. 6.

The effects of glaciation are seen in the scraped and rounded rock surfaces and in the thin coating of very coarse drift that covers the hills. Glacial grooves and striations are common and are especially well seen on most freshly uncovered rock surfaces. The best defined scratches trend between N. 2° W., and N. 24° W., and in many localities two sets of striae are seen on the same rock surface, differing in direction as much as 20 degrees. Those striae which trend between 15 and 20 degrees west of north are approximately at right angles to the terminal moraine and indicate, with other evidence, the southward direction of the movement of the ice sheet during its last advance. Those having a trend more nearly north and south may show the direction of ice movement during an earlier stage of glaciation.

The oncoming ice sheet removed all the loose preglacial surface material and cut to some extent into the solid rock below. The amount of erosion, however, was not uniform. The retention of the flat upland surfaces shows that the ice was not powerful

enough to reshape the hills markedly. On the other hand the ice seems to have done considerable cutting on northwest slopes. East-west spurs were probably prominent in this region in preglacial time, for the rocks are of unequal hardness, and a submature stage

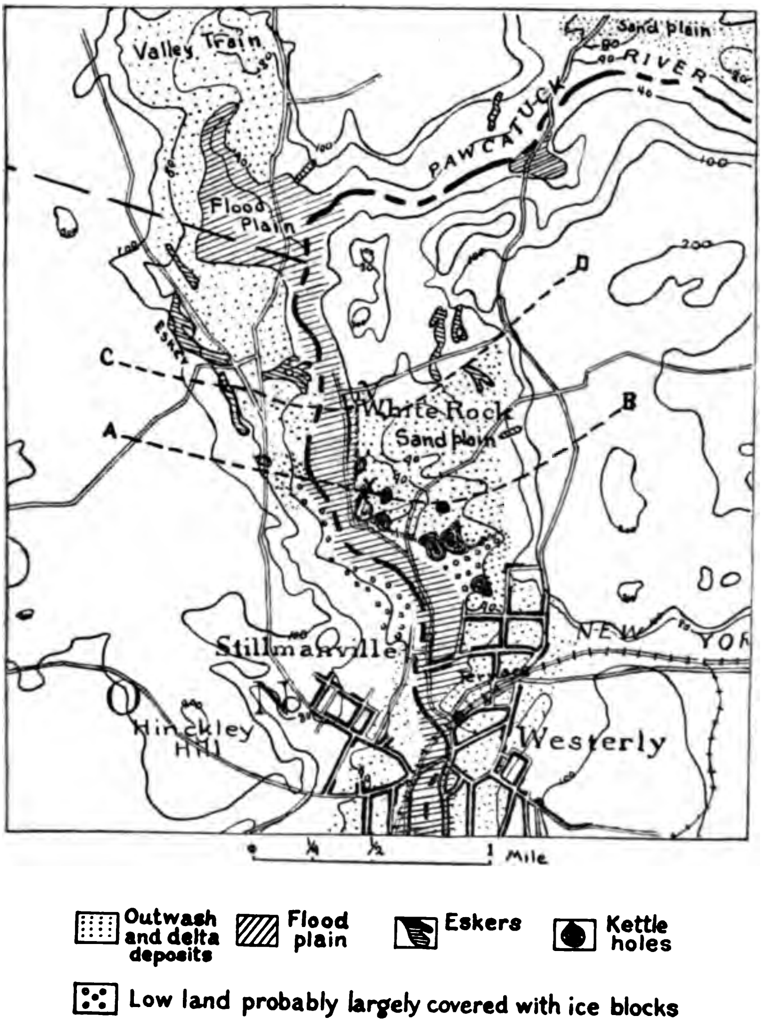

FIGURE 6. Fluvio-glacial deposits near White Rock and their relations to the present floodplain, and the probable positions of the ice front. High level delta south of point X on line A-B. Contours drawn at 40, 80, 100 and 200 feet above sea level.

of erosion is indicated by the uplands. The absence of such spurs, and the great breadth of the valleys as compared to their length, show that the north-south drainage lines were probably considerably widened and straightened by glacial ice.

Huge boulders scattered throughout the region show that the ice was a powerful plucking agent. The largest are joint blocks which were broken off from the vertical cliffs seen in so many places. These cliffs are generally nearly parallel with the direction of ice movement, the trend of those best developed being N. 18° E., N. 2° E. or N. 12° W. There was, however, little rounding of the sharp edges of either the blocks or the cliffs. The largest observed block measured 20 by 40 by 50 feet.

On the whole, glacial erosion probably did not greatly change the topography of the region; the shapes of the hills remained essentially the same, only subdued slightly in outline. This may be explained by the fact that the ice sheet, which at its maximum extended only 20 miles farther south, must have been relatively thin and ineffective in this region.

Under the ice, especially near its terminus, were streams of water, which here and there carved channels in the underlying rock. A small channel of this nature is well developed on an inclined rock surface in a ledge of contorted hornblende schist on Quarry Hill in Westerly. It is 15 feet in length, irregularly curving, and ranges in width from 8 inches to 3 feet, and in depth from a few inches to a foot, and is shown in Plate V, b.

THE TERMINAL MORAINE

The pronounced terminal moraine extending northeasterly from Watch Hill is part of the inner, or Harbor Hill, moraine of Long Island (shown by two dotted lines in Fig. 7), which is commonly accepted as marking the maximum advance of the continental ice sheet during the late-Wisconsin stage of glaciation. The material of which it consists is chiefly tan-colored clay, containing many boulders both of large and small size, and irregular patches of roughly stratified sand.

The moraine is easily recognized and is a striking scenic feature along the coast. The topography needs no special description, as it is typical in every respect. The "kame and kettle" feature, however, is admirably developed and may be seen very

advantageously near Watch Hill. In fact, this hummocky ridge has been justly called one of the "finest examples of glacial dumping grounds in the East."[1]

GROUND MORAINE

North of the terminal moraine the drift shows great irregularity in distribution and thickness. The broad flat tops of the hills have a substantial coating of till, but the slopes, especially if steep, show more or less extensive outcrops of bedrock. Only rarely is

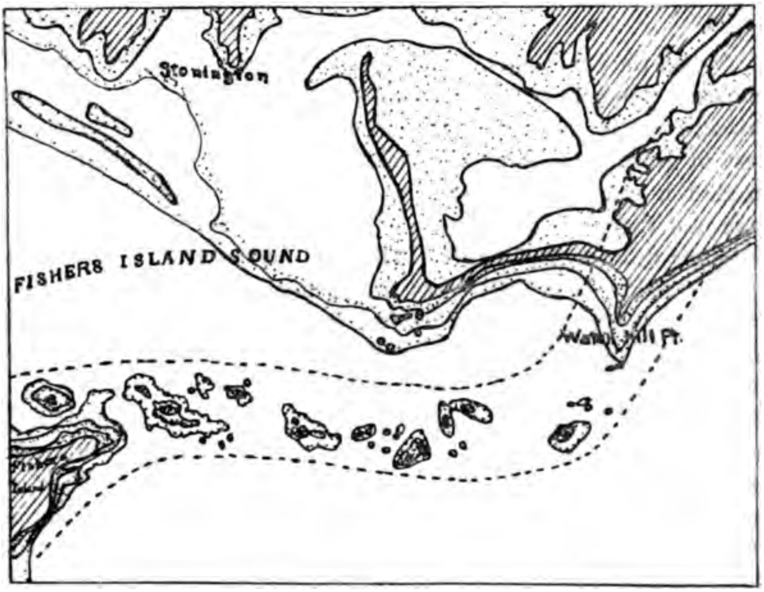

FIGURE 7. Map showing connecting reefs between Fishers Island and Watch Hill. Submarine contours drawn at 6, 12 and 18 feet depths. Drawn from Coast and Geodetic Survey Chart No. 358, 1911.

a hill found that is entirely till covered. Williams Hill, two miles east of Mystic, is of this nature, and its long oval form indicates that it is undoubtedly a true drumlin. On the hills the drift consists of buff-colored sandy clay containing boulders three to eight feet in diameter. Most of the boulders are local in origin, but several, including some very large ones, were transported a considerable distance. The largest erratic noted in the region is more

[1] J. F. Kemp, The granites of southern Rhode Island and Connecticut. Bull. Geol. Soc. Amer., vol. 10, p. 362, 1899.

than 10 feet in diameter and, as it consists of Preston gabbro, must have been transported at least seven miles.

Weathering has affected the upper 12 to 18 inches of the drift, changing its color from light tan to brown. The soil proper is never very black and is only three to four inches thick. Even in the weathered zone, most of the stones are still fresh, except those of dark schist which are generally rotten not only near the surface but at depths of several feet.

FLUVIO-GLACIAL DEPOSITS

When the ice sheet stood along the line marked by its terminal moraine, much material was deposited by glacial streams on the lowland to the south, building up an outwash plain. North and east of Brightman Pond the plain gives way to outwash-covered ground moraine, with large boulders and bedrock outcropping here and there. The outcrops of bedrock show that the deposit is rather thin in this locality. The few cuts made in the material show roughly stratified sands and gravels, the latter including some beds of large cobbles. After the ice melted back from the terminal moraine the glacial waters were concentrated in the pre-existing valleys and on the lowland to the north.

Fluvio-glacial material is found in most of the lowlands, rising in places 20 to 80 feet above river levels. These deposits were clearly made as the ice melted off the region for the last time. A well driven in the Pawcatuck valley at White Rock, and also one at Bradford, however, show that fluvio-glacial material extends 60 to 90 feet below sea level. At White Rock this deeper material is separated from the fluvio-glacial material above by a layer of clay six feet thick, but at Bradford the layer of clay just below river level is lacking. It is not possible to say whether or not all the fluvio-glacial material to a depth of 90 feet or more below sea level was deposited during the final retreat of the ice. For a time blocks of ice remained over much of the land abandoned by the glacier, and in places were sufficient to dam the extraglacial streams, producing local lakes. The presence of these stranded masses of ice seems to account for: (1) the kettle holes and other phenomena associated with the sand plains, (2) certain low portions of valleys which are free from fluvio-glacial deposits, and

(3) the local lakes in which much of the fluvio-glacial material appears to have been deposited.

TERRACES

Small, discontinuous sand and gravel terraces, rising 15 to 25 feet above the river are found along the east side of the Pawcatuck between one and three miles south of Westerly. Their flat tops and steep fronts suggest that they were deposited as deltas in local lakes rather than in the sea. These deltas lack the continuity and accordant summits of marine terraces, and one also fails to find wave action or shore features on the outside of the moraine to prove a lower stand of the land while these deltas were being built, or later. The lack of fluvio-glacial deposits along the southwest side of the present embayment of the river suggests the presence of considerable ice over parts of the lowland, probably enough to form the small lakes.

Westerly and Stillmanville are built on terraces which stand about 40 feet above sea level. Numerous excavations show relatively fine stratified and cross-bedded material overlain by six to ten feet of the coarsely stratified drift. At Stillmanville the capping material is particularly coarse, the boulders ranging from six inches to two feet in diameter. The Westerly terrace is quite flat, but improvements in connection with the building of the city make impossible a detailed analysis of its form.

THE WHITE ROCK SAND PLAIN

South of White Rock and east of the Pawcatuck is an interesting accumulation of fluvio-glacial deposits, the largest and most complex in the Stonington region. The deposits are practically continuous with those at Westerly farther south, and are undoubtedly connected with them in origin.

The White Rock sand plain rises abruptly from the floodplain of Pawcatuck River (Plate VI, b, and Fig. 8). It is generally flat-topped but is pitted with a number of roughly circular kettle holes 100 to 300 feet in diameter and 20 to 35 feet deep. Along its southwest border is a patch of flat land, about one-eighth mile in length and 50 to 100 feet in width, which rises 20 feet above the plain, or 65 feet above river level.

The sand plain has a smooth outline where Pawcatuck River has cut a steep erosion face (Fig. 8). Elsewhere the border is very irregular, particularly on the southeast where there are several projections resembling eskers which lose their flat tops within a few feet of the sand plain. The reëntrants in the sand plain between them generally head in bowl-shaped depressions similar to a kettle hole with one side lacking.

The terrace on which Westerly is built extends within a few hundred feet of the White Rock sand plain, and in the area between them are broad, irregular depressions, occupied by peat

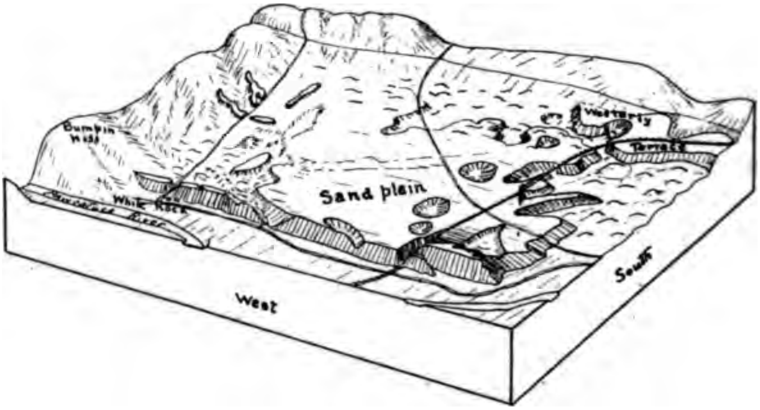

FIGURE 8. Block diagram illustrating the relations of the White Rock sandplain to the Pawcatuck River and neighboring hills and lowlands. View from southwest.

bogs. Although the sand plain and terrace are near together and stand at the same level, there is no evidence that they were once joined and later separated by post-glacial erosion. Along its northeast border the sand plain, interrupted with kettle holes and irregular depressions, merges into the ground moraine on the adjacent hill slope. On the north, a lowland separates the sand plain from the rock hills and marks the position of the ice edge, during the time when most of the sand plain was being constructed. (Line C-D, Fig. 6).

The material forming the sand plain is similar to that of outwash deposits but generally better stratified. Most exposures show two distinct parts, a lower of finely stratified deposits, horizontal or steeply dipping, and an upper of horizontal, coarsely stratified

material. In places, also, the lower beds include cobbles up to nine inches in diameter, well set in stratified sand, which seem to imply the presence of ice blocks. Contorted strata, perhaps due to the drag of such blocks just after the lower fine-grained material had been deposited, are also conspicuous features (Plate VII, a.).

This bipartite structure of the fluvio-glacial deposits is lacking in the little patch of high level sand in the southwest corner of the White Rock plain. At this place the material is approximately the same in texture and structure from the top to the bottom of the deposit, and was probably made at an earlier date or under different conditions.

The White Rock sand plain seems to have been made by the outwash of material into a valley so choked with blocks of ice as to cause ponding. Standing water was undoubtedly present for a great part of the time, as shown by the fine stratification, ice-rafted boulders, ripple marks and cross-bedding seen in the lower beds. The presence of finely stratified material at a higher level than the rest of the deposit east of the river, and an indistinct terrace on the west side of the river near the end of an esker, indicate approximately the initial water level. With the retreat of the ice to the north and the lowering of the level of the standing water to not less than 30 feet above the present river, the lower beds of the rest of the sand plain were deposited. These seems to have been laid down in standing water very near the edge of the ice. The upper horizontal beds were probably deposited as subaerial outwash on the lower delta beds, either because the lake drained away or because the lower beds had been built up to the water level. The process seems to have been continuous for the great blocks of ice included in the delta deposits persisted until after the whole series was deposited.

The lowland must have been largely covered with ice blocks to account for the blunt headed reëntrants and finger-like projections of the sand plain. As the small projecting ridges are not delta fingers and have not been isolated by post-glacial erosion, the conclusion seems reasonable that they were deposited as the rest of the sand plain was, but between great blocks of ice.

The original size of the sand plain, the area occupied by ice blocks, and the extent of the temporary lake cannot now be exactly determined. The glacier itself held in the lake on the north, and

probably stood along the line A-B (Fig. 6), while the high level delta was being deposited, and then retreated to the line C-D while the rest of the sand plain was built. On the south the lake probably extended about one mile south of Westerly, for the level of the Westerly terrace corresponds closely with the general level at White Rock plain and from there southward great fluvio-glacial accumulations on both sides of the valley are lacking.

The structural features seen in the White Rock sand plain are duplicated to a certain extent in other similar deposits of the region. At Potter Hill, finely laminated sandy clay underlies coarse outwash, and has been used for the manufacture of brick.

The sand plains of the region stand at different heights, and in some the delta structure extends to the top, as at Ashaway, so that local conditions undoubtedly governed deposition and there was no widespread lake or higher sea level at any time during their formation.

ESKERS AND VALLEY TRAINS

Much material was carried forward to the White Rock sand plain by subglacial streams, and eskers lead into the Pawcatuck valley from the west and north. Those streams that helped to build the delta when the ice stood along the line A-B (Fig. 6) deposited material in their channels which was later partly covered by the delta when the ice retreated to the line C-D.

A strong subglacial stream came in from the northwest, for several eskers are located along the Pawcatuck-Shunock valley. These eskers are not continuous, nor very large, but are well formed and in places extend 40 to 60 feet up the sides of the hills. The distribution of these eskers is shown in Fig. 6. The largest esker sends one branch to the east which terminates in a number of distributaries running east and southeast on top of a small rock hill just across the valley from White Rock. These distributary ridges are most interesting, for although they cap a rock hill, yet they enclose a perfectly formed, deep, steep-sided kettle hole. Another branch continues south along the west side of the valley and undoubtedly was the chief line of subglacial drainage into the lake when the ice stood along line A-B (Fig. 6). Small eskers, extending down the sides of the rock hills, occur also in other parts of this particular region.

A typical valley train occurs in the valley of Shunock River and in the Pawcatuck valley north of White Rock. It is gently undulating, rises gradually to the north, and for the most part consists of very coarse and poorly stratified material. Irregularities of the surface are due chiefly to the unequal thickness of the underlying till and to knobs of rock, many of the latter rising like islands from the gently sloping plain. The valley train also contains kettle holes and uncovered low places in much the same relation as at White Rock, showing that ice blocks were not lacking.

GLACIAL LAKE BEHIND THE TERMINAL MORAINE

Water also undoubtedly accumulated back of the terminal moraine during the retreat of the ice, and a shallow lake once occupied the marsh-covered lowland east of Westerly. Just what were its relations to the lakes in the river valleys, and how far it extended cannot now be told, for the lake was evidently too short-lived to develop well-defined shore lines. Its existence, however, is shown by the perfectly flat plains between the present swamps and lakelets, by the subdued character of the ground moraine near this low level, and by finely laminated sands overlying the till. Further evidence of this lake is found in the ancient stream channel between Quarry Hill and the terminal moraine south of Westerly. The floor of this well-defined valley is covered in places with heavy boulders which the small stream now occupying the valley is incapable of handling. Toward the end of its existence the lake was probably very shallow, for a rise of only a few feet in the level of the swamps would cause a considerable volume of water to take the more direct route of this ancient outlet to the sea. The decrease in the supply of water as the ice left the region, and the melting of the ice blocks in the fluvio-glacial deposits in the valleys, was evidently sufficient to lower the lake level so that it was eventually drained by the present Pawcatuck River.

EVIDENCE OF MORE THAN ONE STAGE OF GLACIATION

The great bulk of the known unconsolidated deposits of the region was laid down by the continental ice sheet, and its attendant waters, when the ice stood along the line of the terminal moraine and later when it finally retreated from the region. This stage of glaciation is called the late-Wisconsin. There are, however, sev-

eral localities where evidence is found of an earlier advance of the ice which extended farther southward. This stage is commonly known as the early-Wisconsin.

One of these localities is at Weekapaug on the Rhode Island shore, east of Watch Hill, where glaciated rock surfaces and till occur south of the terminal moraine of the region. The till is indistinguishable from that found north of the moraine. Another locality is on the outer side of the terminal moraine just east of Watch Hill, and shows very perfectly stratified sandy clays cut off unequally and overlain by six feet of very coarse till. The presence of water to the south suggests that the sandy clays may be an interglacial marine deposit, in which case a considerable change in altitude of the land would be indicated between the deposition of the two deposits. The stratified beds, although unidentifiable

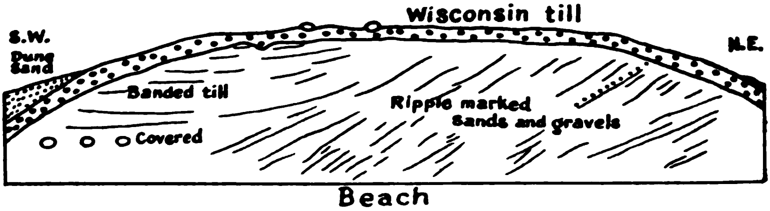

FIGURE 9. Diagram of sea-cliff at Watch Hill. Stratified sands and gravels grade upward into banded till and sand layers, and are overlain by a layer of Wisconsin drift and dune sand.

in this place, are very much like the Jacob sand described by Fuller[1] from Isabella Beach, Fishers Island.

Near Watch Hill Point similar evidence is found. The point itself is a boulder platform resulting from the removal of the lighter drift material by the waves. The first hill to the northeast is part of the terminal moraine proper, and is the highest point on the shore for many miles. On the landward side it is an ordinary round hillock, strewn with boulders and recent dune sand, similar to many other knobs in the moraine. It rises 50 to 60 feet above the sea, and nearly half of it has been cut away by the waves. The eroded face (Fig. 9) shows the hill to consist chiefly of stratified sands and gravels, above which, and making an angular uncon-

[1] M. L. Fuller, Geology of Fishers Island, Bull. Geol. Soc. Amer., vol. 16, pp. 367-390, 1905.

formity with the stratified beds, is a thin layer of till similar to that found elsewhere in the region (Plate VII, b.). The till is two to three feet thick on the average but thickens on the slopes and is five to eight feet thick in a small depression near the top of the hill.

There is no doubt that the material of the lower stratified beds was washed out from the edge of a nearby glacier and deposited in water. Only a glacier could accumulate such a heterogeneous mixture of stones, some of which are subangular in shape and even retain a few striations. Local contortions and cuttings of the layers, and also pockets of gravel and incorporated boulders, show that ice blocks were probably present while the beds were being deposited.

The lower beds dip steeply toward the west (Fig. 9) and then grade upward into layers which are nearly horizontal. The latter include banded till, cross-bedded sands, and some thinner beds of coarse pink sand or fine gravel. Some of the banded till layers are a few inches, others two to three feet, in thickness, the latter carrying large boulders. But the beds traced in either direction thicken or thin decidedly within short distances, and even play out. The apparently massive till, when examined carefully, is seen to be finely laminated.

The position of these stratified beds in the outermost part of the terminal moraine suggests that they were deposited in the sea, in which case a change of 60 feet or more in the altitude of the land must have taken place before the deposition of the overlying till, for the latter shows no evidence of having been deposited in water. As this is believed to call for considerable time, the exposure may indicate two episodes in a single stage or perhaps even two stages of glaciation. Upholding the latter view is the suggestion of an erosional interval between the stratified beds and the till. The evidence is a little depression, apparently a small stream channel, in the top of the stratified deposits. It is well seen, although only four feet deep, because the filling of till contains conspicuous white boulders (Plate VIII, a.). There is also a suggestion of an earlier weathered zone in the yellow gravels and sands which lie just below the till.

Before two glacial advances of considerable importance can be postulated for the region, however, marine fossils or other positive evidence of the marine origin of the stratified beds would have

to be found. The short subaerial erosion interval between the two deposits may mean only a withdrawal of the ice front for a short distance, exposing previously deposited outwash beds. The readvance of the ice in this case would be only a short episode in the retreat of the glacier.

An exposure on the eastern border of the region is interesting in this connection. At Newhall's new quarry, at Bradford, a cut shows till, three feet deep, overlying peculiarly contorted stratified beds, which in turn are underlain by till (Plate VIII, b.). The upper till is similar to the Wisconsin till seen elsewhere, except that it is somewhat less sandy, and contains boulders two to five feet in diameter. The lower contact of the upper till is remarkably even and has no relation in character and position to the underlying stratified beds. The stratified beds bend up very sharply over boulders in the underlying till, and break a little and thin out in so doing. The fact that the beds are as much folded below as above suggests that they were probably frozen at the time they were deformed and acted more or less as a unit.

Toward the west the contorted beds grade over to heavy gravel and finally to interbedded gravel and banded till layers, the banded till being very similar to that exposed at Watch Hill. In fact the resemblance between the deposits as a whole at these two localities is so great that the writer is inclined to correlate them with each other, and to assume that this intermediate stratified series was also deposited in the sea if the other shall prove to be marine. In this case a former depression of the land 120 feet below its present elevation would be called for.

The presence of the heavy till bed and striated rock below the banded till layers at Bradford, however, shows that the ice was thick enough to erode the submerged rock surface, the banded till evidently being formed only when the ice grew thin.

Banded till is found extensively developed on Long Island and Fishers Island, generally associated with a thick deposit of water-laid sands and gravels. These beds are called by Fuller "the Montauk till" and "Herod gravel", and are supposed to have been deposited during the Manhassett glacial stage, when the land stoo 0-100 feet lower than at present. They are everywhere separat from the overlying drift by an erosional unconformity, and d

ing the interval thus indicated—the Vineyard—the land is supposed to have stood some 350 feet higher than at present[1].

The exposures of these beds seen on Long Island by the writer, although indicating an oscillating ice edge, are no more convincing of distinct glacial stages than those in the Stonington region. The best exposure, showing nearly the whole range of glacial deposits found on Long Island, was seen at the Phoenix gravel pit on Hempstead Bay. There the overlying drift was five feet thick but increased to about 25 feet in the old river valleys carved in the underlying stratified beds.

The writer, however, although convinced of two glacial advances over the southern part of the Stonington region, does not believe that any part of the exposed drift is pre-Wisconsin, as interpreted by Fuller for Fishers Island and Long Island. With the exception of the few exposures mentioned, which may be considered early-Wisconsin, no exposures gave any indication that the deposits were not all of the same age, namely, late-Wisconsin. It is believed that the terminal moraine does not represent a thin veneer of drift over an erosional topography, for it has all the characteristic features of a true moraine. Nor is it possible that the moraine is a pressure ridge, for bedrock outcrops through it at the bend of Pawcatuck River and north of Weekapaug, and the ice as a whole would have been resting on bedrock when its edge was along the terminal moraine.

Post-glacial Events

CHANGES OF LEVEL

The post-glacial drowning of the southern New England coast is well shown in the Stonington region by the embayed coast line and the submerged channels in the Pawcatuck and Mystic Rivers. The channel of Pawcatuck River, where it is known to be in solid rock at Pawcatuck Rocks two and one-quarter miles south of Westerly, has a depth of 19 feet. As this locality is three and one-half miles from the mouth of the river, an assumption of a depression of about 20 feet is probably justified. It may be noted that Fuller estimated that a former elevation of 20 to 25 feet would account for all the phenomena of post-glacial submergence seen

[1] M. L. Fuller, U. S. Geol. Survey, Prof. Paper 82, pp. 199-208, 1914.

on Long Island.[1] Moreover, there appears to be no evidence of a still lower stand of the land in post-glacial time, for late-Wisconsin till, as originally deposited, extends to present sea level in well exposed positions.

The question whether the land along the New England coast did not stand, during post-glacial time, at an elevation greater than 20 to 25 feet above the present level has been raised by both botanists and geologists.[2]

Fernald has stated[3] that the coastal plain plants "either migrated northward on the continental shelf prior to the Wisconsin glaciation and persisted outside the subsequently glaciated area, finally taking possession of their present isolated habitats on the receding of the ice or, as seems to me perhaps equally probable, the continental shelf, including the present southwestern half of the Gulf of St. Lawrence, must have been considerably elevated after the Wisconsin, long enough for the migration, including some mammals, and even fresh water and land snails."

The botanical evidence that there was a land connection during post-glacial time between Long Island, Fishers Island, and the mainland of Rhode Island, and consequently that the land stood more than 20 to 25 feet higher than at present, is based on the following facts: (1) Southeastern Connecticut appears to have been the center of distribution of many plants which migrated from the south via Long Island; (2) certain coastal plain plants, which could not have migrated well along an unfavorable coast like that of Connecticut, are found in New Jersey, Long Island, Block Island, Marthas Vineyard, and Nantucket, and less commonly near the shore in Massachusetts and Rhode Island. On this basis an elevation of at least 120 feet would be called for, which would lay bare a considerable part of the continental shelf.

However, it does not seem necessary to account for this distribution of plants by assuming that the land stood 120 feet above its

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[1] M. L. Fuller, Geology of Long Island, N. Y. U. S. Geol. Survey, Prof. Paper 82, p. 216, 1914.

[2] Arthur Hollick, Plant distribution as a factor in the interpretation of geological phenomena. N. Y. Acad. Sci., vol. 12, pp. 189-202, 1893.

M. L. Fernald, Botanical Expedition to Newfoundland and Labrador. Rhodora, vol. 13, pp. 109-162, 1911. See also, Amer. Jour. Sci., vol. 40, p. 17, 1915.

G. E. Nichols, The Vegetation of Connecticut. Torreya, vol. 13, no. 5, 1913.

J. Barrell, Factors in movements of the strand line and their results in the Pleistocene and post-Pleistocene. Amer. Jour. Sci., 4th ser., vol. 40, p. 13, 1915.

R. A. Daly, Oscillations of level in the belts periferal to the Pleistocene Ice Caps. Bull. Geol. Soc. Amer., vol. 31, pp. 303-318, 1920.

[3] Personal communication to J. Barrell, and quoted by him in his paper cited above.

present level. Seeds are often carried on the feet and in the intestines of birds, and the maximum distance of 35 miles between Block Island and Marthas Vineyard is not excessive for such a method of transportation. Wind distributes seeds, particularly of the grass family, for distances exceeding that. Reference to the Coast and Geodetic Survey charts, Nos. 1211 and 358, will show that there are numerous reefs and submerged platforms between the eastern end of Long Island and Nantucket, which, from their shape and position, are eroded portions of the same terminal moraine found in the adjacent land areas. Many of these reefs were undoubtedly islands which stood above sea level for hundreds of years but have been destroyed by wave erosion. These islands would have lessened materially the expanse of salt water over which seeds had to be transported.

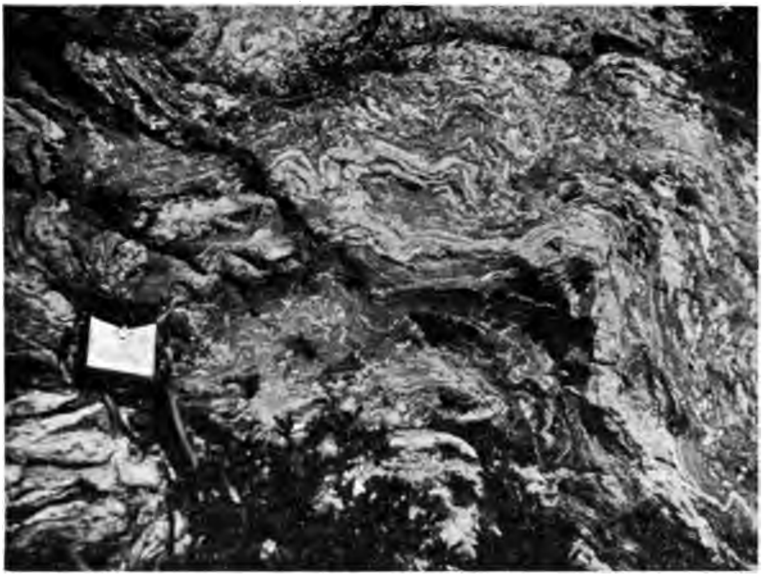
Channels on the continental shelf have also been urged as proof that at some time since the ice sheet receded the land stood much higher than at present. Deep channels cut the terminal moraines, both the outer and the inner, attaining a maximum depth of 53 fathoms, so that on this basis a post-glacial elevation of 318 feet would be demanded. But these channels are seen to be best developed where the oncoming tides are most narrowly constricted, as between Long Island and Plumb Island and between Gull Island and Fishers Island. A careful study of the charts, however, leads to the conclusion that these channels, or deeps, give evidence only of scouring by tidal currents. Thus the land may have stood as much as 300 feet, or more, higher than at present in post-glacial time, but the evidence from the coast of southern New England is not wholly conclusive.

EFFECTS OF WAVE ACTION

Post-glacial stream erosion has produced little change in the general topographic features except for the deepening and widening of valleys which were filled with stratified drift. Wave erosion, on the other hand, has produced some striking changes in the coast line, especially in Rhode Island, for there nothing checks the force of the waves from the open sea. The terminal moraine is being cut back at Watch Hill and the material shifted both eastward and westward by waves and tidal currents, thus giving

rise to a "winged beheadland". What formerly were island or promontories of drift have been reduced to reefs and boulder platforms just below sea level. One of the most striking results of wave work is the beach which connects Watch Hill and Napatree Point, and the hooked spit which extends northward from that point to Sandy Point (Fig. 7). This spit has grown notably and changed its shape within recent years, and particularly since 1895 when the breakwater south of Stonington was completed.

PLATE I.

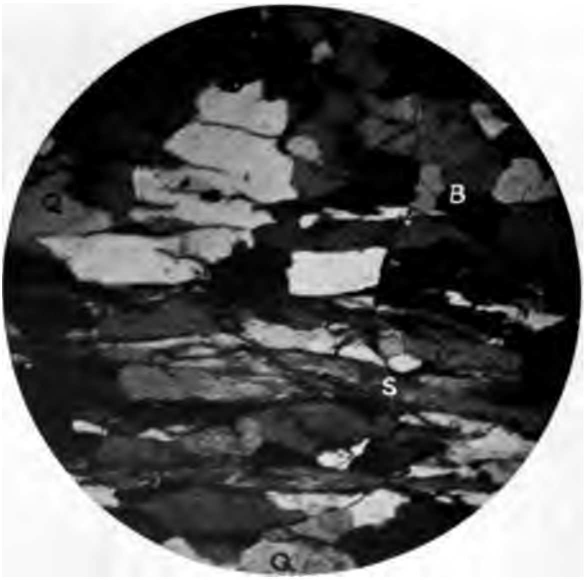


a. Contorted quartzite, quartz-biotite schist and hornblende schist layers, injected by igneous quartz parallel to the bedding and cut by stringers of pegmatite, south slope of Diamond Hill, a mile northeast of Ashaway, R. I.

b. Muscovitic Sterling Redstone granite invading crystallized Kingston sediments in irregular sheets, south end of Tower Hill near Wakefield, R. I. A, Kingston sediments. B, Muscovitic Sterling Redstone granite

PLATE II.

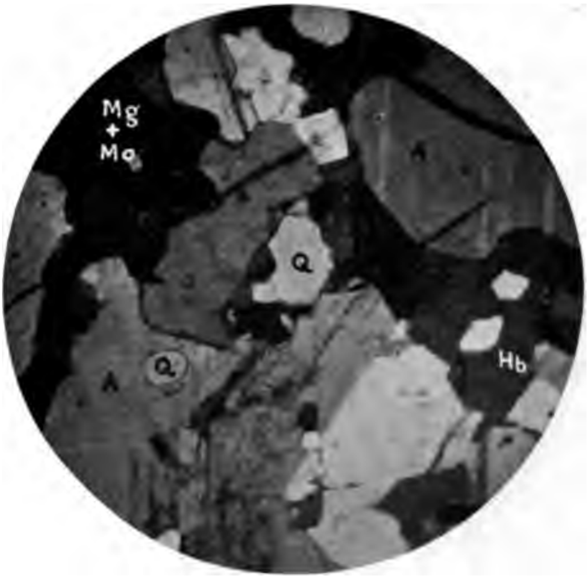
a. Meta-conglomerate from one mile west of Ashaway, R. I. Part of a sillimanite-schist pebble is shown in the lower half of the slide, and the quartz-biotite matrix in which it is embedded in the upper half. Quartz (Q), biotite (B), sillimanite fibers (S), garnet (G). Magnified 24 diameters, nicols crossed.



b. Meta-conglomerate from Wordens Pond, R. I., showing similarity to the meta-conglomerate of the Ashaway region (Plate II, a). Sillimanite-schist pebble below, quartz-biotite schist matrix above. Quartz (Q), biotite (B), sillimanite fibers (S). Magnified 24 diameters, nicols crossed.

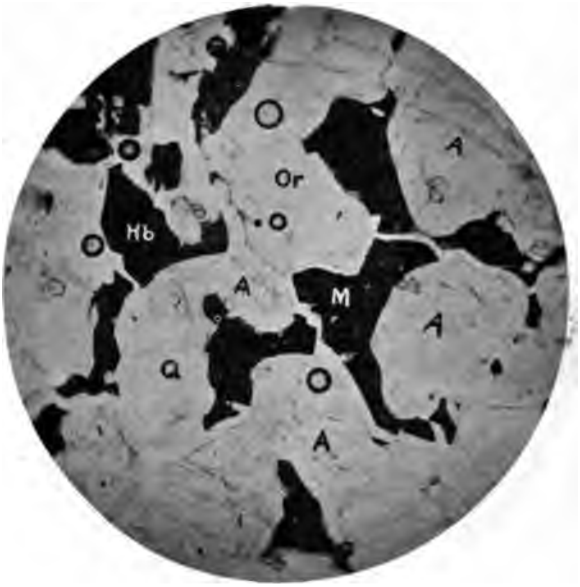
PLATE III.

a. Meta-conglomerate from southwest corner of Narragansett Basin. Quartz (Q) in large and small grains, biotite (B), muscovite (M). Magnified about 24 diameters, nicols crossed.



b. Stonington quartz-diorite. Andesine (A), hornblende (Hb), quartz (Q), large magnetite grain (Mg), surrounding monazite crystals (Mo), seen on left. Magnified 24 diameters, nicols crossed.

PLATE IV.



a. Basic segregation or inclusion in Stonington quartz-diorite showing magnetite (M) in an interstitial position between andesine (A), quartz (Q) and orthoclase (Or). Hornblende (Hb) on the left is in much the same relation. Cracks in the slide unfortunately separate the minerals. Magnified about 24 diameters. Ordinary light.

b. Alaskite from hill, northwest of Ashaway showing micro-faulting in albite (A) in center. Other minerals are microcline (M) and quartz (Q). The black streak in the large microcline crystal on the left is a crack filled with limonite.

a. Garnetiferous, hornblende-pyrite-plagioclase mass in Stonington gneiss (quartz-diorite), probably showing assimilation of lime-magnesian rocks, Stonington Road near Wequetequock.

b. Schist with granite stringers showing varying degrees of folding. Curved groove is subglacial stream channel. North end of Quarry Hill, Westerly, R. I.

PLATE VI.

a. Drop between the 300-foot and 200-foot levels at the southern end of Wintechog Hill. View taken from Pitcher Mt., showing that at this distance (two and one-half miles), adjacent terraces cannot be differentiated by the unaided eye. The scarp between the levels occurs at the point a, and can be seen by holding a straight edge parallel with the sky line in the left half of the picture.

b. Sand plain at White Rock as seen from the floodplain of the Pawcatuck River on the west. The part to the south, between a-b is 20 feet higher than the rest of the deposit.

PLATE VII.

a. Near view of contact of coarse and fine beds in the finger-like projection of the sand plain southeast of White Rock, showing contortions probably due to the drag of icebergs.

b. Contact between Wisconsin till (upper right hand), and stratified sands and gravel below, in wave-cut cliff, Watch Hill, R. I.

PLATE VIII.

a. Valley cut in horizontal beds of banded till and crossbedded sands and filled with coarse drift, Watch Hill cliff.

b. Waterlaid gravels and sands overlain by till and showing peculiar contortions over boulders in an underlying bed of till. Newhall's new quarry, Bradford, R. I.

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